ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
COMPREHENSIVE WATER
AND
WASTEWATER EVALUATION
VOLUME I
AND
APPENDICES C,D,E

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APPENDICES

ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ASRF	Advanced Size Reduction Facility
BOD	Biochemical Oxygen Demand
CAMU	Corrective Action Management Unit
CMS/FS	Corrective Measures Study/Feasibility Study
CWTS	Caustic Waste Treatment System
D&D	Decontamination and Decommissioning
DCHP	Dicesium Hexachloroplutonate
DCP	Direct Cementation Process
DCS	Distributed Control System
DOE	Department of Energy
FSAR	Final Safety Analysis Report
FTU	Field Treatment Unit
FY	Fiscal Year
GAC	Granular Activated Carbon
IM/IRA	Interim Measure/Interim Remedial Action
ITS	Interceptor Trench System
IX	Ion Exchange
LLW	Low-Level Waste
LWTF	Liquid Waste Treatment Facility
LWTFU	Liquid Waste Treatment Facility Upgrades
MDF	Main Decontamination Facility
MEMS	Multiple-Effect Multiple-Stage
MLL	Mixed Low-Level
MLLW	Mixed Low-Level Waste
MSC	Manufacturing Sciences Corporation
MST	Modular Storage Tank
MTRU	Mixed Transuranic
NCPP	National Conversion Pilot Program

NPDES	National Pollutant Discharge Elimination System
ORS	Organic Removal System
OU	Operable Unit
P&ID	Piping and Intrumentation Diagram
PA	Protected Area
PADF	Protected Area Decontamination Facility
PAM	Proposed Action Memorandum
PCB	Polychlorinated Biphenyl
PFD	Process Flow Diagram
PPE	Personal Protective Equipment
PPRG	Preliminary Programmatic Remediation Goal
PW	Process Water
PWTS	Process Waste Transfer System
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RFEDS	Rocky Flats Environmental Database System
RMRS	Rocky Mountain Remediation Services
RTG	Resource Technologies Group, Inc
UV	Ultraviolet
VC	Vapor Compressor
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant
WRA	Waste Receiving Area
WSE	Waste System Evaporator
WSIP	Wet Sludge Immobilization Process
WSRIC	Waste Stream and Residue Identification and Characterization
WTE	Waste Treatment Evaporator
WWTP	Wastewater Treatment Plant

ABBREVIATIONS

$\mu g/l$	micrograms per liter
g/l	grams per liter
gpd	gallons per day
gpm	gallons per minute
gpy	gallons per year
m^3	cubic meters
mg/l	milligrams per liter
pCi/l	picocuries per liter

1 0 INTRODUCTION

An inventory of wastewater sources at the Rocky Flats Environmental Technology Site (hereinafter referred to as the Site) has been conducted in order to evaluate the characteristics and estimate the volumes of wastewaters potentially requiring treatment This source inventory evaluation includes any applicable stored wastewater, current wastewater sources and projected wastewater streams The detailed inventory characteristics evaluation and volume estimates are integral components of the overall assessment of current and future wastewater treatment requirements With these components identified, A comprehensive treatment strategy can be developed for management of wastewater at the Site for the next twenty years A parallel effort reported in Volume II evaluates the current capabilities of all existing treatment systems at the Site These two volumes provide the basis for the Sitewide Wastewater Treatment Strategy and eventually the associated Implementation Plan

1 1 BACKGROUND

The collection and management of wastewater at the Site has historically included four main categories process wastewater, domestic wastewater, environmental waters (addressed as two separate source categories of surface water and groundwater), and incidental/miscellaneous waters

Process wastewater at the Site may be contaminated with metals, radionuclides, and other non-organic chemicals This wastewater is treated onsite at one or more of the existing treatment facilities designed for radioactive and/or mixed wastes

Process wastewater that is highly radioactive is pretreated for radioactivity reduction in Building 774 before further treatment The less radioactive process wastewater was treated in the 207 series Solar Ponds until the Building 374 treatment facility was constructed in 1978 Since 1978, the process wastewater has been treated in Building 374 radioactive decontamination stages and/or evaporator system

The domestic wastewater includes sewage and some light industrial sources such as cooling tower blowdown Domestic wastewater is treated by the onsite Wastewater Treatment Plant (WWTP) housed in Building 995

Environmental restoration wastewater has been treated at several facilities, including the Building 910 evaporators, which were constructed to treat the wastewater from the Solar Ponds and recovered groundwater from the Operable Unit (OU) 4 Interceptor Trench System (ITS) This water has been treated at the Building 374 facility since 1993, the Building 910 evaporators were shut down in 1994 Groundwater from environmental restoration activities, but not including groundwater recovered by the ITS, is treated in a facility designed to treat Site-specific groundwater contaminants It is expected that leachate water (also categorized as environmental restoration water) from planned landfills at the Site will be treated by the same facility designated to treat Site-specific groundwater contaminants The leachate water is water that may collect on the surfaces of the operational areas of the landfills during waste placement As such, leachate water is discussed in Volume 1 as a potentially contaminated surface water

Miscellaneous water sources include the decontamination pads, construction waters and building roof and footing drains Miscellaneous waters are handled on a case-by-case basis and treated at the most appropriate treatment facility if necessary

As the mission of the Site has changed from weapons production to one of environmental restoration, the requirements for water treatment have also changed The inventory of existing and future sources was conducted to estimate present and future volumes of wastewater, evaluate the characteristics of the wastewater, and identify relevant regulatory information as well as any logistical constraints that would impact treatment options

1 2 METHODOLOGY

The inventory of existing and future wastewater sources was completed by reviewing relevant documents, reports, and Site databases, and by conducting interviews of Rocky Flats personnel Relevant documents and reports reviewed included several similar studies conducted on a portion of the water management system as well as studies on a Site-wide water balance In addition, reports were reviewed on various aspects of Site cleanup for process equipment, buildings, existing stored wastes and environmental restoration issues Two primary databases were utilized to determine wastewater quality information, the Rocky Flats Environmental Database System (RFEDS) and the Waste Stream and Residue Identification and Characterization (WSRIC) Sampling and Analysis Database The Master Tank Database was used to evaluate potential volumes of wastewater generated during both Resource Conservation and Recovery Act (RCRA) and non-RCRA tank decontamination activities Personal interviews were conducted with Site personnel that are knowledgeable in the generation of water attributed to one of the several phases of final Site restoration, including environmental restoration, building deactivation, decontamination and decommissioning (D&D), and tank management In addition, questionnaires and personal interviews were utilized to gather information from the managers of buildings at the Site that still generate wastewater from production or maintenance activities

The key to utilizing the available databases as well as the information collected on questionnaires and available documents is organization and presentation For the process waste streams, summary sheets were prepared for each generator and then summarized by building The summary sheets include the relevant information from the questionnaires on the building mission, the future plans, and the expected D&D information In addition, the appropriate data from the RFEDS or WSRIC databases was provided on the wastewater quality These summary sheets and the questionnaires have been included as Appendix A

In order to utilize the databases provided by Site personnel, some manipulation was required This included converting values to consistent units on the RFEDS and WSRIC databases and calculating tank volumes, where necessary, from dimensions provided The standardization of the available data into a uniform format allows for the development of models and scenarios using a variety of assumptions and operating parameters

The water quality data obtained was divided into two primary areas- environmental data and process data As mentioned, this data was derived from the RFEDS Database and the WSRIC Sampling and Analysis Database Data was obtained from each source for all analytical results available for the time period 1990 through 1995 RFEDS data was obtained for a number of groundwater monitoring wells, the OU1 influent into the ultraviolet (UV) treatment system, the OU1 effluent out of IX-4, and the Building 995 effluent flow WSRIC data was obtained for all available data for the

Site Specific WSRIC streams of interest were identified and the appropriate analytical data was extracted from this database for further analysis

Once the available data was obtained, a series of conversion routines were run in order to achieve a uniform format Once this was accomplished, a number of statistical calculations were performed and a standard series of output reports produced A detailed summary of the data handling, data validation, and software documentation can be found in Appendix B

1 3 REPORT ORGANIZATION

A thorough description of the available data regarding wastewater source inventory as well as any assumptions required to determine the future source characteristics and quantities is given in the remainder of this volume This detailed information is required so that the underlying sources and assumptions can be documented for future evaluation It is expected that as the restoration of the Site continues over the next twenty years, that updated information regarding water sources, characteristics, and volumes will become available The source inventory database and this document can be updated as appropriate

This report is organized into the following source categories Each of these sources will be discussed in detail in the remainder of Volume 1

- Section 2 0, Process Wastewater - consists of current and future dischargers to the Building 374 treatment facility

- Section 3 0, Domestic Wastewater - consists of sanitary and light industrial wastewater

- Section 4 0, Surface Water - consists of water collected in trenches and surface impoundments such as the A, B, and C series ponds, and water collected as a result of operations at a future Corrective Action Management Unit (CAMU) and sanitary landfill

- Section 5 0, Groundwater - consists of recovered groundwater from Site environmental restoration activities, including water recovered with the OU4 ITS

- Section 6 0, Incidental/Miscellaneous Water - consists of water collected in foundation and roof drains, decontamination pads, and other miscellaneous sources

2 0 PROCESS WASTEWATER

Process wastewater has historically included most waters generated as a result of operations at the Site These wastewaters are contaminated with metals, radionuclides, or occasionally trace levels of organics Process wastewater has been treated in the Building 374 treatment facility since 1978 In some cases, streams are pretreated in Building 774 prior to discharge to Building 374 The pretreatment processes are intended to reduce radioactivity in order to meet the Waste Acceptance Criteria for the Building 374 System Process wastewater has been delivered to Building 374 either through the Valve Vault System and Process Waste Collection System or by container or truck

Only a few of the historical dischargers to Building 374 are generating process wastewater presently and are expected to continue to generate process wastewater into the future Other sources may be developed in association with restoration activities during the next twenty years Future activities that would likely be new sources of process wastewater include

- The removal and treatment of solid and liquid residues and mixed low-level and transuranic waste,
- The cleanup of tanks and lines supporting various processes at the Site, and
- The decontamination and decommissioning of buildings

The available information on the sources that historically contribute process wastewater to Building 374 and those sources that may generate process wastewaters are detailed in the following sections

2 1 EXISTING AND POTENTIAL SOURCES

The primary existing sources of process wastewater are all current dischargers to Building 374 via either the Process Waste Collection System or truck These existing sources of process wastewater are dischargers that have historically been part of the manufacturing complex at Rocky Flats and either have a continuing mission (such as the laundry) or continue to generate wastewater because of status quo conditions Some of the sources of process wastewater originate at facilities inside the Protected Area (PA), also known as the Controlled Area and the Industrial Area, which contains the main production facilities as well as the Building 374 wastewater treatment facility The production facilities include systems for the fabrication of plutonium components in support of several nuclear weapons programs Ancillary and support facilities are also contained within the PA Other sources originate at laboratories and machining operations outside of the PA

The sources of water evaluated as historical and current dischargers of process wastewater include the following

- Desaltable Wastewater - desaltable waste is comprised of current process wastewater streams from Buildings 444, 123, and 122 These process wastewaters are generated outside of the PA and do not contain a high amount of radionuclides Historically, these wastes could be transferred directly to the Building 374 Evaporator System

- Treatable Wastewater - treatable wastewater includes utilities, laboratories, and current process wastewater streams from Buildings 707, 731, 771, 774, 776, 777, 779, 865/866, 881/887, and 883 The 700 Complex buildings are located inside the PA and house the plutonium production processes The 800 Complex buildings are located outside the PA and housed the radioactive research and development (R&D) operations, laboratories, and beryllium operations The wastewaters generated from these areas periodically contained greater than 13,500 picocuries per liter (pCi/l) radioactivity and historically were transferred to the radioactive decontamination stages in Building 774 and/or Building 374 prior to evaporation

- Incidental Wastewater - incidental wastewater includes run-on from the 904 and 750 Pads, OU1 regenerant and brine solutions, 910 brines, the 778 sump, the 910 floor, trucked wastewaters, and the 207 Series Solar Collection Ponds

- Laundry Wastewater - Laundry wastewater includes washer water from Building 566

The Desaltable, Treatable, and Laundry Wastewaters are discussed for specific buildings in Section 2 1 1, General Building Operations Wastewater The current discharges from each building as well as the future activities planned for each building are also presented Incidental wastewater is discussed in Section 2 1 2

Other current wastewater sources to Building 374 include water from the ITS at OU4 and miscellaneous waters, including process wastewaters originating at the decontamination pads, construction drains, foundation drains, and roof drains The ITS water is discussed in greater detail in Section 5 0, while miscellaneous wastewater sources are discussed in greater detail in Section 6 0

The potential future sources of process wastewater include several activities that will occur as part of the final building deactivation and restoration of the Site These activities include

- Liquid Stabilization Program - this program has been detailed and is scheduled for completion in 1999 (DOE, 1995a) The program includes the elimination of liquids currently in tanks, process lines, and bottles Tanks and process lines are primarily in Buildings 371 and 771, while bottles are in Buildings 371, 559, 771, 774, 777, and 779 The liquids have been characterized and are known to be relatively high in radioactivity The liquids will be pretreated in Buildings 771 and 774, or 371 Following pretreatment, the liquids will be transferred to Building 374 for final treatment,

- Residue Stabilization Program - this program involves the treatment of waste residues containing actinide concentrations greater than the economic discard limit These waste forms are divided into five categories ash, pyrochemical salts, inorganics, combustibles, and wet miscellaneous The wastes have been characterized as containing toxic metals, reactives, corrosives, volatiles, and semivolatiles It is expected that the treatment of these wastes, particularly the combustibles, will generate wastewater This wastewater will require treatment in the Building 371 Caustic Waste Treatment System (CWTS), followed by carrier precipitation and evaporation in Building 374,

- Mixed Low-Level and Transuranic Waste Treatment - this program is outlined in the *Proposed Site Treatment Plan* (DOE, 1995b), which addresses the treatment of approximately 3,800 cubic meters (m^3) of solid and liquid mixed low-level (MLL) waste and 300 m^3 of solid and liquid mixed transuranic (MTRU) wastes in storage at the Site Mixed low-level wastes are identified for treatment to meet the Land Disposal Restriction treatment standards Mixed transuranic wastes are proposed for disposal at the Waste Isolation Pilot Plant (WIPP) after any treatment required to ensure these wastes are acceptable for transportation to, and disposal at WIPP,

- RCRA Tank Closure - includes the cleanup of RCRA-classified tanks and associated process lines at the Site RCRA tank closure will primarily apply to those tanks and lines that are part of the Liquid Stabilization Program, as well as the tanks identified in the Hazardous Waste Tank Systems Management Plan (EG&G, 1995a),

- Tank Management - includes the management and closure of non-RCRA tanks on the Site This category may include tanks such as raw material feed tanks that may require cleaning prior to decommissioning, and

- Decontamination and Decommissioning - includes the closure and dismantling of buildings at the Site Wastewaters generated from this activity will likely include wastewater used for decontaminating large equipment, such as material handling systems, gloveboxes, and ventilation ducts Decontamination methods have not been selected (e g , acid wash, high pressure spray, adhesives, etc) There is significant variability in wastewater production rates and characteristics, depending on the decontamination method used

The aforementioned activities that are potential sources of wastewater have been grouped in general as activities that must occur for building deactivation The other potential future source of process wastewater is from facility/building redevelopment This includes wastewater generated by future users of the Site because of redevelopment and privatization activities

2 1 1 General Building Operations Wastewater

Building 374 is the main aqueous process waste treatment facility at the Site In order to assess the current generators of process wastewaters, the focus of the evaluation was to identify and quantify the building operations that discharge to Building 374, currently and potentially in the future A number of references were used to identify the current and future process wastewaters The Hazardous Waste Tank Systems Management Plan (EG&G, 1995a) describes the tanks that historically or currently feed process waste to Building 374 Current waste streams that feed the tanks are identified in the plan by their WSRIC stream numbers The WSRIC Building Books (EG&G, 1992, EG&G, 1994a - 1994e, EG&G 1995b - 1995y) give characterization, description, and flow volume information on these waste streams There are several locations throughout the process wastewater collection system that have been sampled and analyzed for contaminant characteristics Pertinent analytical data was obtained from the WSRIC Sampling and Analysis Database The Draft Site-wide Building Use Schedule compiled by the Planning and Integration Organization was used to identify generation timeframes for the process waste streams In addition, questionnaires were utilized in interviews with building managers to identify the process waste streams that currently and potentially feed to Building 374 for treatment The information obtained from these sources is summarized on questionnaires, data summary sheets and compiled data, and process flow diagrams provided in Appendices A, B and C, respectively

A questionnaire solicitation by Rocky Mountain Remediation Services (RMRS) Liquid Waste Programs was issued to the building managers to determine the process wastewater treatment needs for the Site in the near future and in outyears through closure of each building or facility The completion and compilation of questionnaires was included as a work task for this project The solicitation was followed by interviews between representatives from Resource Technologies Group, Inc (RTG) or RMRS and the building managers or knowledgeable Site personnel The information obtained during the solicitation and interviews was recorded by RTG on the questionnaire forms given in Appendix A The requested information included

- Building contacts,
- Volume of wastewater per quarter generated from normal building operations,
- Routing of the wastewater to the treatment facilities,
- Type of process wastewater generated,

- Changes in normal building operations and effect on volume of wastewater generated,

- Predicted wastewater volumes from D&D activities, and

- Chemical composition of the wastewaters

The questionnaires were completed to the greatest extent possible by the building personnel, however, some of the information requested was not known by or available to the building personnel In addition, some building personnel were new to their positions - a result of change in Site contractor in July, 1995 The questionnaires were useful as a starting point for determining the current and future contributions of individual buildings to wastewater generation at the Site

Data sheets have been completed for all of the process wastewater stream numbers given on the process flow diagrams included in Appendix C These data sheets, included in Appendix B, summarize the analytical data and process knowledge information obtained from WSRIC, the questionnaires, and other applicable sources, such as documents, telephone conversations, and schedules The information on the datasheets is contained in a database In order to reduce the amount of effort in extracting and summarizing the WSRIC analytical data, the waste stream numbers are crossed-referenced to the applicable WSRIC stream numbers A statistical analysis is performed on the analytical data and the analysis is summarized on the data sheets In addition to summarizing the analytical data and identifying potential contaminants by process knowledge, the data sheets summarize the projected flowrates and the timeframes for generation

In addition to the individual data sheets for the wastestream numbers noted on the Appendix C process flow diagrams, data sheets are provided for the WSRIC Stream Numbers and composite building streams A discussion of the development of these datasheets and the use of the available databases provided by Site personnel is included in Appendix B

Data provided in the RFEDS and WSRIC databases and the subsequent data compilation provided in Appendix B must be used with caution In general, the samples taken and characterized by this data are a "snap shot" of the waste stream at a discrete point in time With the changing mission of the Site, the characteristics and volumes of many wastestreams are also changing dramatically This data does, however, provide a starting point for this evaluation and in most cases probably provides a conservative estimate of the contaminant loading to be expected The development and use of the Site databases as presented in Appendix B does provide an example and a set up for future evaluations that could be conducted as more data is collected

The process flow diagrams, given in Appendix C, present a schematic of the buildings and types of process wastewaters that currently and in the future will discharge to the collection tanks, transfer lines, and Valve Vault System that makeup the Process Waste Collection System that discharges to Building 374 In addition, the diagrams present the radioactive decontamination stages and evaporation system in Building 374 Schematics of the proposed Caustic Waste Treatment Process in Building 371, proposed Oxalate Precipitation Process in Building 771, and the Carrier Precipitation Process in Building 774 are shown

The process wastewater stream and building discharge streams on the drawings are assigned numbers, such as "PW-774" (RTG-assigned stream number) The number designations are assigned by the following rationale,

- "PW" stands for "Process Wastewater,"
- The number following the hyphen is the building number where the waste is coming from, and
- If more than one waste stream is coming from the building, a letter designation follows the building number, for example, "PW-444A" and "PW-444B "

Four main lines enter Building 374 from the Process Waste Collection System These lines are called the "Desaltable Waste Line," the "Treatable Waste Line," the "Laundry Line," and the "Low-Level/Pond Water Transfer Line " The lines have been designated by the following RTG-assigned numbers

- Desaltable Waste Line - "PE-DWL,"
- Treatable Waste Line - "PW-TWL,"
- Laundry Line - "PW-732" (This wastewater is generated by one building, therefore, it was designated with the building number), and

- Low-Level/Pond Water Transfer Line - "PW-231" (This wastewater is transferred to and from Tanks 231A and B, therefore, it was designated with the building number)

Currently, Building 374 treats aqueous wastes from the following buildings 122, 123, 371, 444, 447, 566, 707, 771, 774, 776, 777, 779, 865/866, 881/887, and 883 Aqueous wastes received from these locations are piped directly into Building 374 through the Process Waste Collection System Building 374 also receives non-pipeline aqueous waste from Buildings 460, 559, 883, and other buildings onsite In addition, Building 374 treats aqueous wastes from the 903A Main Decontamination Facility (MDF) and the Protected Area Decontamination Facility (PADF) decontamination pads, runoff water from the 750 and 904 pads, incidental water from the solar ponds, and other incidental water on a case-by-case basis The non-pipeline aqueous wastes are discussed further in Section 2 1 2 (Incidental Water) and Section 6 0 (Incidental/Miscellaneous Water) Short descriptions of the buildings and wastestreams that are transferred to Building 374 are given below

2 1 1 1 Building 122

Building 122 contains emergency medical services, x-ray development, personnel decontamination, gamma counting facility, medical/infectious waste treatment, and administrative offices Generated waste includes fixers, developers, used bath water, medical waste, and decontamination water (from decon showers) The only wastewater that is sent to Building 374 is decontamination washdown water released to the shower drains or the hair washing sink This wastewater is sent to Vault Valve 18 which goes into the process waste sump (D-853) in Building 428 and eventually to Building 374 for treatment

It is assumed that two decon showers a week will be performed using approximately 10 gallons per shower Recently only about one shower a month has been occurring, but it is anticipated that 2 showers per week is a conservative maximum for the Site as D&D work increases

Currently there are no expected changes that will increase wastewater volumes originating at Building 122 There is a small possibility that the facility will be privatized Privatization may lead to a facility operations change with consequential changes in wastewater generation Rainfall and humidity do not affect wastewater volumes from Building 122

Decontamination and decommissioning of Building 122 will not likely occur until after many of the process areas at the Site have been decontaminated When decontamination of Building 122 does begin, generation of the decon washwater from showers will discontinue Any newly generated wastewater volumes during building decontamination should be small because only very minor building contamination is expected In addition there is no stored wastewater requiring disposal

2 1 1 2 Building 123

Building 123 houses the Radiological Health Laboratories which analyze water, urine, soil, air, vegetation, nose swipes, fecal material, and filter samples for the presence of plutonium, americium, uranium, alpha radiation, beta radiation, gamma radiation, tritium, beryllium, and organics Personnel radiation badges are counted and repaired here Building support services include utilities, electronic equipment servicing, exhaust air scrubbing, and water purification

Several of the analytical procedures use strong acids in fume hoods that are evaporated to the building's plenum system where they are collected in a manual scrubber system Scrubber water is discharged as process wastewater However, the bulk of the wastewater generated in the building is produced during the sample digestion and purification phase of the analysis Some sample waste and rinse solutions are washed down the process drain for eventual treatment in Building 374 There is no long-term stored wastewater

Future wastewater generation rates were estimated by averaging the annual volumes of wastewater sent from Building 123 to Building 374 over the last five years (after production stopped in 1989) The average is 460,000 gpy It is expected that non-sanitary wastewater will continue to be sent to Building 374 for treatment through the year 2005 The current routing of wastewater is to Vault Valve 18 which goes into the process waste sump (D-853) in Building 428 and eventually to Building 374 for treatment

There are currently no expected future scenarios that will have a major impact on wastewater volumes However, major changes in the plant population, the sampling plan, or available Department of Energy (DOE) funding could result in significant changes in volume estimates

Decontamination and decommissioning of Building 123 will not likely occur until after many of the process areas at the Site have been decontaminated (probably after the year 2005) Decontamination and decomissioning operations at other Site facilities are not expected to significantly affect the volume of wastewater generated in Building 123 Once decontamination of Building 123 commences, generation of lab waste will likely discontinue

2 1 1 3 Building 231

Building 231 includes a pump house and two large storage tanks designated 231A and 231B for Desaltable Waste Storage Wastewater that has been decontaminated in Building 374 to 13,500 pCi/l total alpha or less is stored in Tanks 231A and 231B, pending evaporator availability Operable Unit 4 ITS water from the Modular Storage Tanks (MSTs) and decanted solar pond water from the storage tanks on the 750 Pad are stored in these tanks Also stored in Tanks 231A and 231B is concentrate from Building 910 and plenum deluge water from the 400 Area and Building 771 Incidental waters from geotechnical drilling sites, valve vaults, telephone equipment pits, excavations, and natural precipitation which collects in bermed areas are transferred by tankers and dumpster into Tanks 231A and 231B These waters are eventually sent to Building 374 for evaporation

The volume of wastewater sent to Building 374 from Building 231 is variable The tanks hold approximately 1 24 million gallons of wastewater that will need to be treated prior to RCRA closure or decontamination/decommissioning of the tanks At this time, closure or decontamination/decommissioning of the tanks has not been scheduled

2 1 1 4 Building 371

Building 371 contains production support processes that include residue repackaging, laboratory analysis, and standards preparation and inspection The building also contains a dicesium hexachloroplutonate (DCHP) preparation process (DCHP is used to scavenge americium from Site returned metal) These operations are supported by a caustic treatment process, a vacuum pressure system, vent and utility scrubber systems, and other utility processes Building 371 also houses several maintenance shops for service of process and building equipment in 371 and 374 Process wastes (except utilities) are sent to the caustic waste treatment system and the resulting liquid wastes are purged to the 374 building

Currently none of the aforementioned processes (except utilities and the labs) are operating Residue elimination and liquid stabilization programs are being instituted in the building, which will lead to removal of some of the equipment A new caustic treatment system is being installed to support these programs Ultimately, the 371 building is planned to be utilized as a storage facility for plutonium at the Site

Currently, very little water is discharged from this building Most effluent from this building is derived from the following sources and sent to Building 374 only

- Groundwater/seeps leaking into the building and collected in sumps and sent to Building 374 directly,
- Fire system water, which is drained every month and contains some antifreeze,
- Eye washes and safety showers which are tested weekly,
- Leaks from steam condensate lines, and
- Process water from the chillers and the analytical and chemical standards laboratories

All liquid waste effluent from Building 371 will continue on a similar basis as that indicated for 1992 and 1994 until the Liquid Stabilization and Residue Stabilization Programs are initiated Wastewater volumes to Building 374 will temporarily increase during these programs After these programs are completed, the wastewater volume will return to that currently observed while the building is used as a storage facility for plutonium

A new caustic treatment system is scheduled to be installed and brought on-line in the timeframe from December 1995 to March 1996 This system will treat the process wastewaters generated by the Liquid Waste Stabilization and Residue Stabilization Projects as well as Building 371 waste streams The Liquid Waste Stabilization and Residue Stabilization Projects are discussed in detail in sections 2 1 3 1 and 2 1 3 2 The wastewater generated from the Residue Stabilization Program is expected to be higher in chloride and organic concentrations Thus, the effluent produced from the new caustic treatment system may vary in concentrations from that observed from the old caustic treatment system during production periods

2 1 1 5 Buildings 444 and 447

Building 447 processes include utilities (HVAC system), process waste collection and filtration, and routine maintenance Currently no process-specific wastewater is generated in this building, however, potentially contaminated groundwater seepage occurs in this building Collected groundwater seepage is discharged to the process waste collection and filtration system and pumped to one of the two 4,000-gallon sump tanks in Building 444

Components containing beryllium and uranium were manufactured in Building 444 Operations include machining, welding, etching, and coating The building also houses various cleaning processes and sample testing for beryllium These processes generate a variety of liquid wastes, some of which are discharged to the process waste system Recently these operations have been very limited and little wastewater has been generated As with Building 447, the primary source of wastewater is a result of potentially contaminated groundwater seepage Another source is condensate from the HVAC system in the controlled area As much as 2,000 gallons of wastewater a day is pumped from the sumps to Building 374 during a humid, rainy period A drastic change in future use of the buildings (once privatized) could significantly alter wastewater volumes However, current discussion indicate that future use of the buildings will involve similar operations (machining of beryllium-containing parts) and should not result in a significant increase in wastewater generation

Although these buildings are scheduled to be decontaminated and converted to private use by February 1997, potentially contaminated groundwater is expected to continue to leak into the building and be sent to Building 374 for treatment through the year 2005 Rainfall or humidity have a very significant affect on wastewater volumes It is possible that an usually wet season could occur, resulting in higher wastewater volumes

2 1 1 6 Building 460

Building 460 contained the stainless steel manufacturing facility, which housed various cleaning and machining operations, and operations to test the integrity of machined parts The building operations also include utilities for heating, ventilation, air conditioning, and various maintenance operations

Currently, nearly all equipment pertaining to the manufacturing facility has been removed or is scheduled to be removed by the end of Fiscal Year (FY) 1996 However, the utilities portion of the facility remain intact including several swamp coolers The planned future for the building is mostly office space with the high bay utilized as a storage space

Wastewater from this building is sent to the WWTP (Building 995) However, there will be a one time wastewater discharge to the process drain (Building 374) for RCRA closure of the remaining process waste systems This discharge is expected to take place from October 1995 to January 1996 The volume of wastewaters generated from RCRA closures is discussed in Section 2 1 3 4

2 1 1 7 Building 559

Building 559 contains laboratory facilities used to perform analyses of samples from waste production processes and products from all areas at the Site Aqueous sample wastes, chemical extracts, calibration standards, and other aqueous wastes are put in 4-liter bottles for recovery, waste processing, or storage as low-level or transuranic wastes

The aqueous wastes that can be treated in Building 374 are placed in a 55-gallon drum and trucked to Building 374 The waste contains soap, water, and acids The waste is neutralized with sodium bicarbonate prior to being shipped to Building 374 Approximately 55 gallons of aqueous waste is generated each week

Future use of this facility has not been defined at this time For this study, it is assumed that this building will continue to provide the laboratory support it has in the last couple of years

2 1 1 8 Building 566

Building 566 houses a laundry including washing machines, dryers, laundry carts, and radioactivity monitoring equipment It utilizes detergent, bleach, and water The building also houses an emergency generator

Washer wastewater generated in Building 566 is drained into holding tanks, filtered, pumped through Valve Vaults 9, 8, 10, 11, 12, and 13, and subsequently piped to the wastewater treatment process in Building 374 for treatment Sanitary waste is segregated and sent to the sanitary treatment system

Future use of this facility has not been defined at this time If it continues to provide the Site laundry services, wastewater generation rates are expected to remain fairly consistent with those experienced in the first seven months of 1995 It is possible, however, that part of the laundry wastewater in the near future could become categorized as "cold" and sent to the sanitary system For conservatism, it was assumed that the facility will continue operating under the same capacity, which is 13 million gallons per year (gpy), through the year 2005

Currently, the yellow coveralls are sent offsite for laundering The remainder of the Personal Protective Equipment [(PPE) underclothing, gloves, booties, and respirators] are washed onsite Some of this PPE is worn in contaminated areas of Buildings 440 and 444 and is therefore potentially contaminated with beryllium Beryllium-contaminated PPE contributes roughly 10 percent of the total weight of PPE washed Washing this clothing separately could possibly allow the bulk of the laundry wash water to be sent to the sanitary system, since beryllium is the primary contaminant of concern

The pit, Building 732, outside of Building 566 accepts wastewater from both Buildings 566 and 778 Surface water from a leaking condensate line in Building 778 has caused some contamination in the pit Capping the old feeder line from Building 778 would prevent mixing this contamination with the laundry wash water from Building 566, and should be done if this water is to be sent to the sanitary system instead of Building 374 for treatment

2 1 1 9 Building 707

Building 707 houses what was formerly the main weapons components production facility Currently, the anticipated activities for this building include brushing of plutonium oxides from stored items and thermal stabilization of this plutonium oxide along with residue materials from earlier production activities The wastewater generated in this building is condensate from pre-cool coils, plenum drain water, and process water from decon showers, sinks, janitor closets, and floor drains The wastewaters are collected in Tanks 731W and E in Building 731 prior to being sent to Building 374 via Valve Vault 9

The main source of wastewater in Building 707 is the condensate from pre-cool coils Approximately 20,000 gpy (30,000 gpy in humid/wet years) are sent to Building 374 for treatment The other wastewater sources are generated on an emergency basis only

The building will be physically deactivated in year 2006 Until deactivation, it is assumed the process flowrate will be 20,000 gpy

2 1 1 10 Building 771

Building 771 houses the plutonium recovery facilities operated during the production era at the Site The processes are no longer active, however, some of the utilities still generate process wastewater These wastewaters consist of steam condensate, scrubber solution, seal water, decon water, and fire water for the exhaust plenums These wastewaters are stored in tanks 309 E and W prior to pretreatment via carrier precipitation in Building 774, and shipment to Building 374 via Valve Vault 9 for final treatment

Some of the tanks in 771 still contain process solutions and will be emptied per the Liquid Stabilization Program An oxalate/hydroxide precipitation process is proposed for Building 771 to treat the contents of these tanks The effluent from the oxalate/hydroxide precipitation process will be sent to Building 774 carrier precipitation for pretreatment prior to treatment in Building 374

There is insufficient data on the volume of wastewater generated by the utility operations in Building 771 The volume of wastewater generated by the Liquid Stabilization Program is presented in Section 2 1 3 1 The building is scheduled for physical deactivation in 2006

2 1 1 11 Building 774

Building 774 is the high-level aqueous waste treatment facility at the Site Highly radioactive acid wastes, caustic or aqueous wastes, waste oils, and non-radioactive waste photographic solutions are transferred to Building 774 for treatment Four processes in Building 774, (neutralization, liquid waste treatment - 1st and 2nd stages, and precipitation/filtration) use a series of interconnected tanks to treat acidic, caustic, and aqueous radioactive wastes greater than 200,000 pCi/l in radioactivity The effluent is separated from contaminated solids or sludges and transferred to Building 374 for further treatment

Currently, none of the treatment processes in Building 774 are operating As such, Building 774 is not currently contributing process wastewater to Building 374 However, with the startup of the Liquid Stabilization Project, tank closure, and D&D programs, the resumption of operations at Building 774 is imminent

The small amount of wastewater currently sent to Building 374 is derived from the following sources

- Groundwater/seeps leaking into the building, which is collected in sumps and sent to Tanks 203 and 204 in Building 774,
- Fire system water, which is drained every month and contains some antifreeze,
- Eye washes and safety showers which are tested weekly,
- Leaks from steam condensate lines, and

- Chiller condensate

Wastewater flow from the above Building 774 sources to Building 374 will continue at the rate consistent with 1994 and 1995 until the Liquid Stabilization Project, tank closure activities, and D&D operations begin The volume of wastewaters expected for these projects are discussed in Section 2 1 3

2 1 1 12 Buildings 776 and 777

Building 776 contains facilities such as waste-size reduction, supercompaction, utilities, and preventive maintenance Waste-size reduction repacks transuranic, low-level, and mixed wastes for more efficient storage

Currently, very little water is discharged from these buildings Most effluent from these buildings is derived from the following sources and sent to Building 374

- Groundwater/seeps leaking into the building, which is collected in sumps and sent to Tanks T-1A and T-1B, and then to Building 374 via the valve vault system This water is potentially contaminated with radionuclides,

- Fire system water, which is drained every month and contains some antifreeze,

- Eye washes and safety showers which are tested weekly, and

- Leaks from steam condensate lines

Liquid waste volumes from the above sources at Buildings 776 and 777 will roughly be the same as that experienced from 1992 to 1994 until the Advanced Size Reduction Facility (ASRF) comes online The projected volume is roughly the average of the data from 1992 to 1994, which is 8,300 gpy

The ASRF could come on-line in 1998 and would certainly increase quarterly wastewater flowrates to Building 374 The amount of wastewater to be sent to Building 374 from the ASRF is unknown However, testing in 1995 for 5 months produced 3,600 gallons and testing in 1994, for 12 months, produced 14,000 gallons With increased activities it is estimated that the ASRF can generate 80,000 gallons of wastewater per year Wastewater is sent from ASRF to Tanks 1A & B then to the Valve Vault 9 prior to transfer to Building 374 for treatment

2 1 1 13 Building 779

Building 779 contains R&D facilities formerly used to support production and recovery processes Processes involved pyrochemical technology and physical metallurgy Acid solutions generated by the process are treated in Building 774 Liquid wastes are collected in drums or in the process waste collection tank in Room 001 and then routed to Building 776 (Tanks T-2A or T-2B) before going on to Building 374 Excess condensate from the air chillers contributes to much of the process wastewater Other sources of wastewater include groundwater seepage and wash water The groundwater seepage, which contains lead and chromium, could be separated from the nonhazardous chiller condensate

Annual wastewater volumes were assumed to be similar to those of 1994, which totaled approximately 6,000 gpy

An unusually wet or humid season could substantially increase the flowrate because of increased groundwater seepage and chiller condensate This was estimated to increase the flowrates as much as 50 percent

2 1 1 14 Buildings 865 and 866

Building 865 contains shops and equipment that previously supported decontamination, declassification, and scrap consolidation for the building Currently, none of these processes are being performed and the building is scheduled for possible privatization in October of 1996

There is essentially no process wastewater being generated at this time The process wastewater sinks have been sealed and the pieces of equipment with process water lines have been sealed Wastewater generated from the building utilities (evaporative cooler, cooling tower, and heat exchanger) is discharged to the sanitary system Also, this building rarely experiences any groundwater leakage

Very little process wastewater, if any, is expected to be sent from Buildings 865 and 866 to Building 374 over the next year Beyond that time, October 1996, it is possible that the building will be privately used in a similar capacity as it was in the early 1990's, and wastewater generation rates could be back up to 1,200 gallons of wastewater sent each month to Building 374 The process wastewater volumes attributable to redevelopment are discussed in Section 2 4 1

Building 866 contains three 1,200-gallon storage tanks (Tanks T-1, T-2, and T-3) for process wastewater Whenever enough wastewater has been collected, the waste is transferred to Building 374 for treatment There is currently less than one tank full

2 1 1 15 Buildings 881 and 887

Building 881 houses various technical, analytical, administrative, and plant support functions The laboratory processes include, sample preparation, atomic absorption, leaching procedures, ion chromatography, infrared analysis, gas chromatography, plasma spectroscopy, mass spectroscopy, radiochemistry, chemical standards preparation, and materials and surface testing The aqueous waste streams generated from these processes include rinse water from washing glassware, atomic absorption aspirant, excess trapping solutions, unused aqueous samples, waste acids, expired standards, reagent solutions, ion exchange column wash, and used water samples

Because of RCRA requirements, all but 3 sinks connected to the process waste line were shut down in 1991-1992, and many of the processes (not listed above) were deleted Two process sinks are in Room 272 and one is in Room 137 The sink drains tie into a common line that feeds into the tank system in Building 887

The utilities process for Building 881 includes a scrubber system Mist precipitate from the exhaust air scrubbers flows into the process drain and onto the process waste tanks in Building 887 Blowdown from the cooling towers flows to the sanitary sewer

Building 887 contains seven 2,500-gallon stainless-steel waste tanks for Building 881 process waste The only wastewater generated in this building is some groundwater leakage, contributing possibly 50 gallons a day (any leakage into Building 881 goes to the sanitary system)

Future use or shutdown of these buildings has not been scheduled at this time Thus for this study, it was assumed that these buildings will continue to provide the support they have in the last couple of years An extremely wet season would likely increase groundwater leakage, but not that significantly Privatization, a change in the buildings' missions, or procedural changes could result in a substantial change in process wastewater generated, but such change cannot be predicted

The only stored process wastewater is what is temporarily stored in the tanks in Building 887 prior to transfer to Building 374 Most RCRA waste has been removed from Building 881

2 1 1 16 Building 883

Building 883 processes involved the preparation of metal parts for further processes in the building and throughout Rocky Flats Parts were cleaned, rolled, and formed before use by machining and production processes Presently, all production processes have been shutdown, including the process waste system, and the building is undergoing decontamination Some wastewater is being generated from processes such as electropolishing, washing, scrubbing, steam stripping, and exit showering Wastewater is currently drummed and sent to Building 374 for processing Plans are to set up two 500 gallon tanks for temporary storage of process wastewater until it is sent to Building 374 Decontamination and decommissioning operations are expected to be complete by the end of 1996, at which time the building will be put up for bid Private operation of the building may commence as early as October 1997 Use of the facility at that time is currently undefined but is expected to be somewhat similar to when the building was fully operational

2 1 2 Incidental Water

The majority of the incidental water is the result of precipitation events during which water is collected in contaminated areas of buildings, pads, or other Site systems In addition, aqueous secondary wastes generated by other treatment facilities contributes to the Incidental Water source Incidental waters include run-on waters, OU1 water, Building 910 brine, Building 788 sump, Building 991 floor water, and trucked wastewaters Each of these sources are described below

2.1 2 1 Run-on Waters

Run-on waters are collected from the 750 and 904 Pads These are both bermed and covered pads used to store collected low-level and mixed wastes The 750 Pad is a fenced and bermed asphalt pad containing six large tent structures The open pad area and tents are used for the controlled storage of pondcrete, saltcrete, containerized pond sludge, Investigative Derived Materials, and a lesser amount of process-generated waste containing a wide variety of radioactive and hazardous contaminants Operations are limited to maintaining the stored wastes in compliance with environmental and safety rules and regulations During precipitation events, precipitation collected on the pad runs to low spots in the bermed area around the pad The precipitation water collected on the 750 Pad is classified as a nonhazardous, nonradioactive waste, however, if a spill is reported on the pad, then any collected precipitation water is sampled If required, based on the results of the sample analysis, the water is sent to Building 374 for treatment, otherwise, the water is pumped over the bermed area

The 904 Pad, which is similar to the 750 Pad, is a fenced and bermed asphalt pad containing four large tent structures The open pad area and tents are used for the controlled storage of pondcrete and saltcrete, and some process generated waste containing a wide variety of radioactive and other hazardous contaminants Operations are limited to maintaining the stored wastes in compliance with all governing environmental and safety rules and regulations Stored wastes require regular inspections to ensure the integrity of the packages and the contents The precipitation water collected on the pad area runs to low spots in the bermed area around the pad According to process knowledge, this incidental water contains no RCRA hazardous constituents and exhibits no RCRA hazardous characteristics If a spill is known to occur, the water is sampled and sent to Building 374 if necessary, otherwise, the water is pumped over the bermed area

The operating life of both of these storage pads is indefinite due to the continual production of the waste materials and the lack of an appropriate final storage site for this type of material

2 1 2 2 OU1 Water

The waters historically treated in Building 374 from the OU1 treatment facility are neutralized ion exchange regenerant streams The volume of wastewater sent to Building 374 is dependent on the volume of wastewater treated at OU1 The historical generation of wastewater from OU1 relative to the water treated is shown in Table 2 1 (EG&G, 1993a - h, EG&G, 1994a - h, EG&G, 1995a and b, RMRS, 1995)

TABLE 2 1
OU1 WASTEWATER HISTORY

TIMEFRAME	WATER TREATED	WASTEWATER TO 374
Second Quarter 1993	513,000	30,000
Third Quarter 1993	166,000	30,000
Fourth Quarter 1993	210,000	31,000
First Quarter 1994	180,000	12,408
Second Quarter 1994	540,000	44,000
Third Quarter 1994	138,000	16,000
Fourth Quarter 1994	39,000	4,000
First Quarter 1995	46,000	0

The amount of regenerant produced from the OU1 water treatment facility is also dependent upon the amount of contaminants in the influent stream to OU1 that are removed by the ion exchange systems Therefore, it is difficult to determine a volume of spent regenerant produced per volume of water treated There was a significant decease in both spent regenerant solutions and water treated during the fourth quarter of 1994 due to changes which were made within the OU to decrease the amount of water that required treatment

The spent, neutralized regenerant solution is high in TDS and contains some radionuclides and potentially some nitrate

2 1 2 3 910 Brine

Building 910 contains an evaporator system that was used to treat ITS water This water is currently treated at Building 374 and the 910 evaporator is not in operation

The historical source of process wastewater was the evaporator brine or bottoms which was sent to Building 374 for further concentration If future plans require the use of the Building 910 evaporator, then this will be a source of a potential future waste stream

The Building 910 evaporator system is designed to treat an influent waste stream containing 6,000 mg/l of TDS and produce a brine slurry of 430,000 mg/l for a concentration factor of approximately 70 Depending upon a future influent stream to the Building 910 evaporator, the waste stream that required treatment would be approximately 70 times more concentrated than the water being treated

2 1 2 4 788 Sump and 991 Floor

Building 788 was a support facility for pondcrete processing and repackaging, and is currently used for pumping water and storing low-level mixed waste Incidental wastewater is collected in the sump of Building 788 as a result of precipitation This is designated a low-level, mixed waste and is known by the generator to be contaminated with RCRA F-listed solvents, wastewater treatment sludges, spent cyanide plating bath solutions and multisource leachate

Building 991 houses facilities for the storage of radioactive material, laboratory operations, alarms maintenance, and testing of items from other buildings on the Site The exact source and volume of wastewater from Building 991 has not been completely defined at this time

2 1 2 5 Trucked Wastewater

Trucked wastewater is received at Building 374 from process buildings on the Site Some of the buildings that truck waste on a regular or scheduled basis are described below

- Building 559 - Trucked wastewater is received on a routine basis from Building 559, which contains laboratory facilities Aqueous waste generated is stored in drums and approximately one drum per week is transferred to Building 374 for treatment The drums typically contain soap and hydrochloric or nitric acid The acids are neutralized with sodium bicarbonate prior to shipment to Building 374 (Refer to Section 2 1 1 7 for details of this waste stream)

- Main Decontamination Facility - Water from the MDF is either trucked to Building 891 or Building 374 for treatment and is discussed in Section 6 0 - Incidental/Miscellaneous Water

- Protected Area Decontamination Pad - Water from the PADF is either trucked to Building 891 or Building 374 for treatment and is discussed in Section 6 0 - Incidental/Miscellaneous Water

- Building 883 - Trucked wastewater is received on a routine basis from Building 883, which contains electropolishing, washing, scrubbing, steam stripping, and exit showering activities Aqueous waste generated is stored in drums and approximately 7,000 gpy is transferred to Building

374 for treatment (Refer to Section 2 1 1 16 for details of this wastewater)

- Wastes currently stored in tanks prior to RCRA closure in Buildings 883 and 460 are currently scheduled to be transferred by truck to Building 374 for treatment There is approximately 750 gallons of wastewaters currently in the tanks in Building 460 and an unknown amount of wastewaters in the tanks in Building 883

2 1 2 6 207 Ponds

The 207 Series Solar ponds were the collection point for the Rocky Flats aqueous wastestreams during production There is an extensive effort underway to collect and contain sludge within these ponds for RCRA closure activities The final closure plan for the ponds includes placing a cover over the ponds that extends to the northern edge of the PA The cover will be composed of the following layers vegetation, top soil, compacted soil, two sand drains, high density polyethylene, and clay (EG&G, 1994) The interceptor trench located around the ponds will be covered as part of the pond closure activities The scheduled completion date is mid-1997 [1]

Until the ponds are remediated, the precipitation and surface run-off that collects in the ponds is currently being treated in Building 374 The volume of runoff, using 1994 and 1995 averages, is 215,000 gpy

1 Personal communications with K Wiemelt of Kaiser-Hill 9/21/95

2 1 3 Building Deactivation

The six major elements of building deactivation that have the potential of generating process wastewater requiring treatment were briefly presented in Section 2 1 and will be detailed in this section

2 1 3 1 Liquid stabilization program

The liquid stabilization program at the Site is described in *Liquid Stabilization Program, Program Plan* (DOE, 1995a) This plan identifies the methodology by which actinide-bearing solutions currently in tanks and piping in Buildings 371 and 771, and plastic bottles in various locations at the Site will be treated to convert them to a safe, storable form The program mission as identified in the program plan is to be accomplished by processing the actinide-bearing solutions into one of the following forms plutonium oxide, meta- and di-uranates, cemented 55-gallon barrels (transuranic waste), cemented boxes of saltcrete (low-level waste), and carrier precipitation-produced sludge (transuranic waste) The program has targeted December 1997 as the completion date for safely eliminating all solutions in Building 771, and June 1999 as the completion date for safely eliminating all solutions in Building 371

The *Liquid Stabilization Program, Program Plan* states that approximately 30,000 liters (7,945 gallons) of solution are subject to the Liquid Stabilization Program and are contained in 172 tanks and associated piping in Buildings 371 and 771 and 637 plastic bottles currently located in Buildings 371, 559, 771, 774, 777, and 779 Bottle and tank inventories are summarized in Tables 2 2 and 2 3, respectively

TABLE 2 2
BOTTLED SOLUTION INVENTORY

CURRENT BUILDING	NUMBER OF BOTTLES	ESTIMATED VOLUME (Liters)	ACTINIDES CONCENTRATION	PROCESSING DESTINATION
371	48	171 5	waste<0 0245 g/l	774/374 carrier prec
	11	22 0	to be blended (1)	774 bottle box cement
	3	12 0	>6 0 g/l	771 processing
559	8	32 0	>0 0245<6 0 g/l	774 bottle box cement
	127	496 0	waste <0 0245 g/l	774/374 carrier prec
	8	18 5	to be blended (1)	774 bottle box cement
	11	42 0	>6 0 g/l	771 processing
771	97	358 5	>0 0245<6 0 g/l	774 bottle box cement
	89	340 5	waste <0 0245 g/l	774/374 carrier prec
	99	200 0	to be blended (1)	774 bottle box cement
	60	283 5	>6 0 g/l	771 processing
774	28	108 0	waste <0 0245 g/l	774/374 carrier prec
	12	200 0	>0 0245<6 0 g/l	771 processing
777	385	1544 0	>0 0245<6 0 g/l	771 processing
	1	2 0	to be blended (1)	774 bottle box cement
779	23	41 0	to be blended (1)	774 bottle box cement
	12	39 0	>6 0 g/l	771 processing

(1) To be blended solutions range in concentration and will be used as solutions of opportunity to dilute with the other three categories for waste minimization and optimal processing

TABLE 2 3
TANK AND ASSOCIATED PIPING INVENTORY

	NUMBER OF TANKS	ESTIMATED VOLUME (LITERS)	ACTINIDES CONCENTRATION	PROCESSING DESTINATION
Bldg 371				
Tanks	80 1	10,548 120	<1 5 g/l >1 5 g/l to be blended	batching/371 CWTS proc 371 CWTS Proc
Actinide Piping	n/a	4,855	average 1 0 g/l to be blended (1)	batching/371 CWTS proc
Nonactinide Piping	n/a	3,182	reagent acids and bases	batching/371 CWTS proc
Total 371		18,705		
Building 771				
Tanks	12 3 72 4	944 700 2,516 129	<6 0 g/l <0 0245 g/l >0 6 g/l uranium>1 5 g/l and chloride >1 0 g/l	774 bottle box cement 774/374 carrier precip 771 oxalate processing 771 hydroxide processing
Resin Column Liquids	n/a	100	Acid rinse liquid	774 bottle box cement
Actinide Piping	n/a	1,800	>6 0 g/l	771 oxalate processing
Nonactinide Piping	n/a	1,356	reagent acids and bases	batching/771 processing
Total 771		7,545		

The major elements of the liquid stabilization program include

- Transfer solutions from existing tank systems to bottles or new tanks and characterize by sampling and analyses,
- Transport bottles from five Buildings (371, 559, 774, 777, and 779) to Building 771 for processing,
- Precipitate actinides from solutions in preparation for waste treatment, if necessary, through hydroxide or oxalate precipitation in Buildings 771 and 371,
- Eliminate solutions through existing waste treatment processes (Direct Cementation or Carrier Precipitation) in Buildings 774 and 374, and
- Transfer resulting product and waste forms to appropriate programs

The optional treatment processes for bottled solutions are noted in Table 2 2 These processes include 774 bottle box cementation, 774/374 carrier precipitation, and 771 processing The optional treatment processes for tank and associated piping solutions are noted in Table 2 3 These processes include batching/371 Caustic Waste Treatment System, 774 bottle box cementation, 774/374 carrier precipitation, 771 oxalate processing, and 771 hydroxide processing A summary of these treatment processes is included below Note that these processes are depicted in Figures 2-1 and 2-2

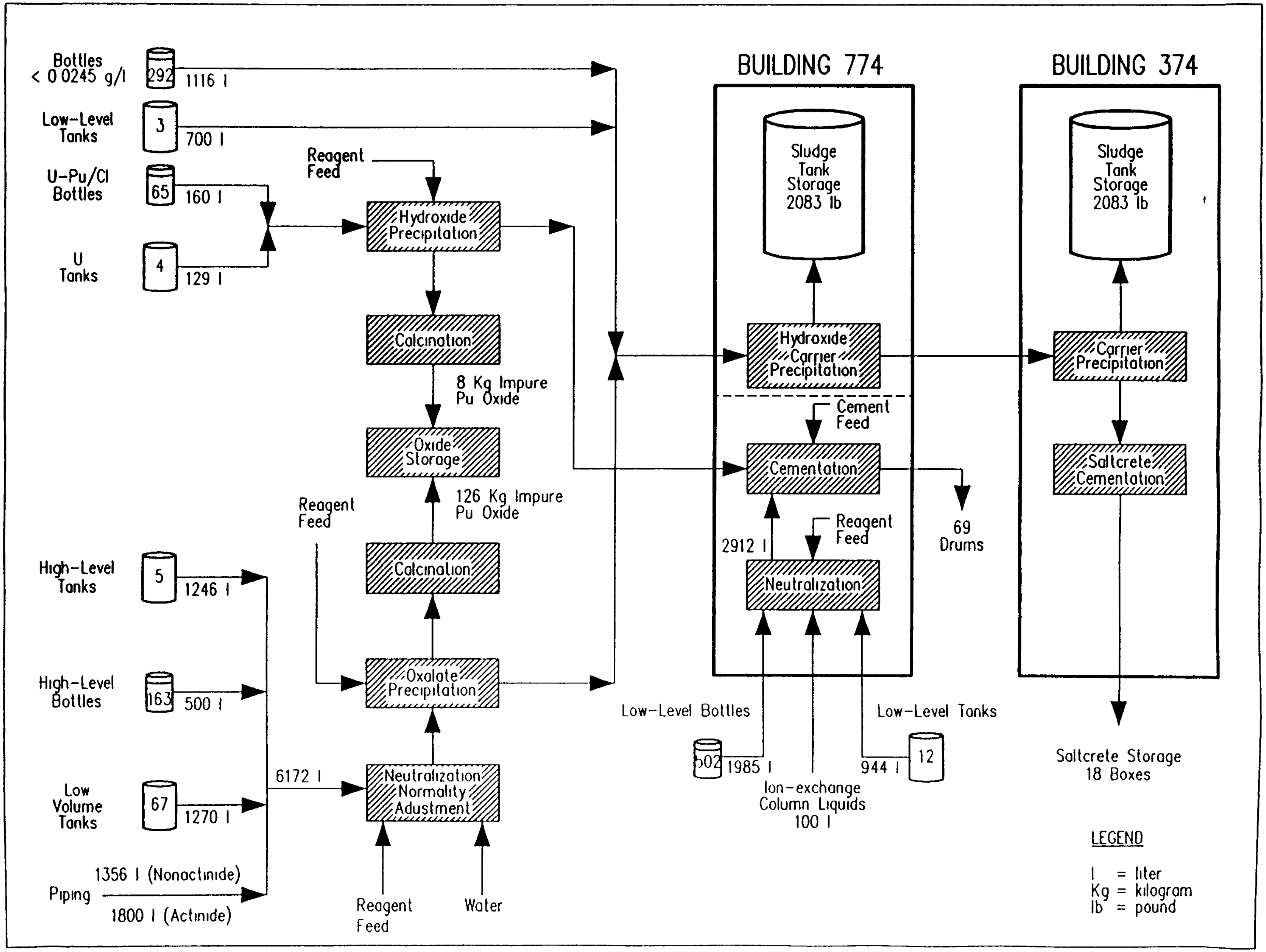

Figure 2-1 Building 771 Actinide Solution Process Flow Diagram

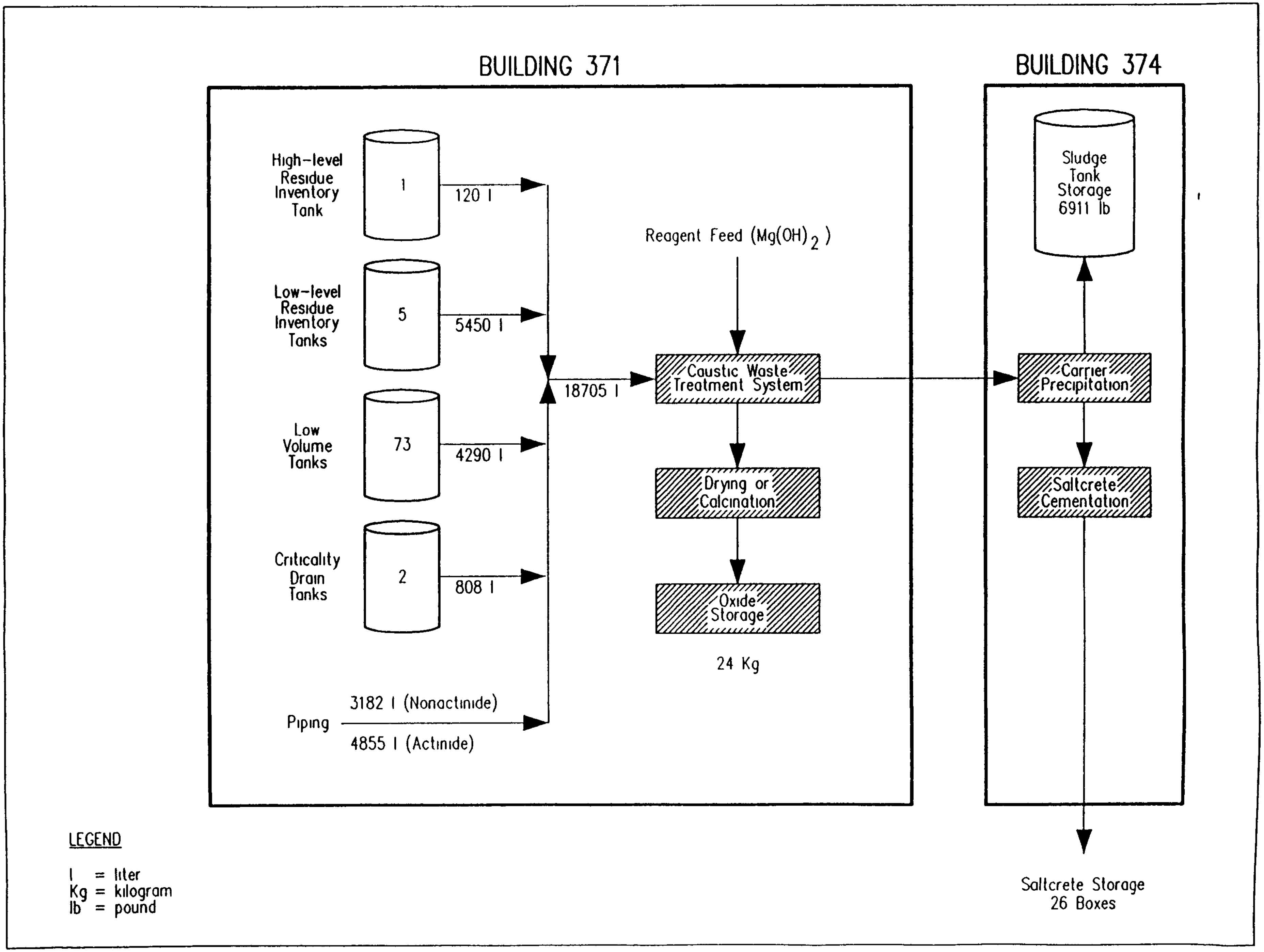

Figure 2-2 Building 371 Actinide Solution Process Flow Diagram

Building 774 bottle box cementation will be used to eliminate solutions containing up to 6 grams/liter (g/l) total actinides The cementation process will not generate any liquids requiring treatment by a central treatment facility Building 774 carrier precipitation will be used to treat solutions containing less than 0 0245 g/l total actinides Filtrate from the Building 774 carrier precipitation will be transferred to Building 374 for further carrier precipitation Building 374 carrier precipitation effluents will be transferred to the Building 374 evaporator Building 771 hydroxide precipitation will be used to treat solutions containing greater than 1 g/l chloride and/or uranium with a total actinide concentration greater than 6 g/l Filtrates from the hydroxide precipitation process will be bottled and transported to direct cementation for disposal as waste, thus, this process does not generate any liquids requiring treatment by a central treatment facility Building 771 oxalate processing is a precipitation process that will be used to treat solutions in Building 771 containing plutonium with a total actinide concentration greater than 6 g/l The oxalate process will result in a filtrate requiring further treatment by the Building 774 carrier precipitation process, which, ultimately, will result in a filtrate that will be transferred to Building 374 for carrier precipitation As noted above, Building 374 carrier precipitation effluents are transferred to the Building 374 evaporator The Building 371 CWTS will be used to treat all solutions contained in Building 371 that exceed the waste transfer shipping limit of 0 004 g/l plutonium for Building 374 receiving tanks All filtrate from the CWTS will be transferred to Building 374 for further treatment

The *Liquid Stabilization Program, Program Plan* does not detail specific reagent addition needs As a result, liquid volumes that may require treatment at Building 374 (or other central treatment facility) can only be estimated The plan notes that the liquid stabilization program targets approximately 30,000 liters (7,925 gallons) of actinide-contaminated solution for treatment It is reasonable to assume that the liquid stabilization program will result in less than 50,000 liters (13,210 gallons) of solution requiring "polishing" for actinide removal at Building 374 or other central treatment facility The assumption of 50,000 liters (13,210 gallons) would include the identified solutions in tanks, piping, and bottles as well as miscellaneous reagents added for treatment The estimated volume does not include tank flushings, which may be part of decontamination efforts for tanks and associated piping in Buildings 371 and 771

2 1 3 2 Residue Stabilization Program

The Residue Stabilization Program is focused on the treatment of waste containing actinide concentrations greater than the economic discard limit Wastes targeted under this program are divided into five categories ash, pyrochemical salts, inorganics, combustibles, and wet miscellaneous The wastes have been characterized as containing toxic metals, reactives, corrosives, volatiles, and semivolatiles The ash will most likely be treated by calcination in Building 707 The salts will most likely be treated by molten salt extraction in Building 779 The inorganics will be repacked The combustibles will be treated by electrochemical nitrification or Detox processes Finally, the wet miscellaneous will undergo washing type operations in Building 371 It is expected that the treatment of these wastes, particularly the combustibles process, and potentially the ash treatment process, will generate wastewater For the most part, the wastewater is spent scrubber solutions that are discharged once the solutions contain five percent total solids This wastewater will require treatment in the Building 371 CWTS followed by carrier precipitation and evaporation in Building 374

It has been estimated that the total wastewater volume requiring treatment will range from approximately 100,000 to 500,000 liters (26,500 to 132,000 gallons) over a period from 1998 to 2002[2] This wastewater should be contaminated with trace levels of actinides (<0 5 g/l plutonium) and possibly up to 100 milligrams/liter (mg/l) of volatile organic compounds (VOCs) The VOCs may be reduced to 1 mg/l if a polishing treatment system, such as UV oxidation, is used prior to transferring the waste to Building 371 Other major ions present will be nitrate, carbonate, sulfate, and chloride, which may be present at a concentration approaching 1 percent The chloride ion represents 75% of the ions present in solution

2 1 3 3 Mixed Low-Level and Transuranic Wastes Treatment

The *Proposed Site Treatment Plan* (DOE, 1995b) addresses the treatment of approximately 3,800 m^3 of solid and liquid MLL waste and 300 m^3 of solid and liquid MTRU wastes in storage at Site Mixed low-level wastes are identified for treatment to meet the Land Disposal Restriction treatment standards Mixed transuranic wastes are proposed for disposal at WIPP after any treatment required to ensure these wastes are acceptable for transportation to, and disposal at WIPP

<u>Mixed Low-Level Wastes</u>

The treatment of MLL waste at the Site is expected to be completed through the appropriate use of three possible treatment systems These systems include System 2/4B, System 3, and System 5 (DOE, 1995b) System 2/4B is intended to immobilize radionuclides, metals, and low concentrations of organic compounds using cementation, polymer solidification, or microwave solidification System 3 is intended to immobilize radionuclides, metals, and low concentrations of organic compounds

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2 Per material balance notes on the combustibles stabilization process Completed by T C Johnston on 8 18 95

using cementation or polymer solidification System 3 includes significant pretreatment measures System 5 is intended to remove organic compounds or radioactive contamination from the surfaces of various solid waste types System 5 interfaces with System 3 and System 1B, which includes non-thermal treatment to chemically destroy organic materials Estimates of wastewater generation resulting from the three aforementioned systems are included in Table 2 4 These estimates were derived from information contained in a Treatment Implementation Plan for System 2/4B (DOE, 1994a), a personal communication with Mr Joe McKaig[3] for System 5, and a personal communication with L M Hall[4] for System 3 Wastewater generation associated with each of these systems is expected to occur at the noted rates periodically over a 15 year period beginning in 2005 The beginning of treatment may be accelerated to the year 2000

TABLE 2 4
MLL WASTE TREATMENT WASTEWATER GENERATION RATES

SYSTEM	WASTEWATER FLOW (gpy)	CONTAMINANTS
System 5	<800	Trace levels of metals, radionuclides, and possibly organics
System 3	<3,000	Trace levels of metals, radionuclides, and possibly organics
System 2/4B	<30,000[5]	Trace levels of metals, radionuclides, and possibly organics

3 Personal communication with Mr Joe McKaig of RMRS System 5 wastewater generation based on material balance for cyanide wash 9 13 95

4 Facsimile received from L M Hall on Sept 12 1995 Includes schedule and material balance for System 3

5 Wastewater results from a scrubbing system wash of sludge dryer gaseous effluent

Mixed Transuranic Wastes

The current DOE national strategy for management of MTRU waste is to segregate MTRU wastes from MLL wastes, to maintain the MTRU wastes in safe interim storage, to characterize, certify, process if necessary, and package the wastes to meet WIPP waste acceptance criteria (WAC), and to permanently dispose applicable MTRU waste at WIPP (DOE, 1995b)

Two options for disposal of Rocky Flats MTRU wastes have been analyzed One of these options, referred to as Path F in the Comprehensive Treatment Management Plan, is Treatment of MTRU Wastes to Meet WIPP WAC An analysis of Rocky Flats MTRU concluded that four treatment or processing methods are required to prepare a portion of the MTRU wastes for disposal at WIPP The treatment or processing will likely entail elements of repackaging, immobilization, neutralization, and oxidation Details on treatment elements have not been identified to date As such, potential wastewater generation as a result of MTRU waste treatment cannot be quantified It is reasonable to assume, however, that wastewater generation rates would be similar to those rates noted under MLL waste treatment

2 1 3 4 RCRA Tank Closures

A RCRA identification number is assigned to 495 of the tanks listed on the Master Tank Database as of August 28, 1995 These were tanks that were permitted by the State of Colorado for the purposes of treating or storing hazardous wastes In accordance with RCRA requirements, a RCRA tank must undergo closure according to specific regulatory requirements A closure plan for each tank has been prepared in support of the RCRA permitting process for the tank or tanks covered under each

RCRA permit These closure plans outline the steps required for the closure of the tanks, associated ancillary equipment, and secondary containment areas

RCRA closure of tanks and tank systems occurs following removal of residual materials in the tanks These residuals are handled prior to the initiation of RCRA closure In general, the RCRA tanks are handled according to two programs at the Site These programs include

- Mixed Residue Tanks - include 172 tanks covered under the Liquid Stabilization Program that contain mixed (both hazardous and radioactive) wastes, and

- Hazardous Waste Tank Systems Management - includes 262 tanks and three associated treatment units (EG&G, 1995a) that are covered under the Interagency Agreement, with the exception of those tanks that are currently active

The number of tanks reported by the Liquid Stabilization Program (172) and the Hazardous Waste Tank Systems Management Plan (262) do not add to give the number listed in the Master Tank Database (495) The difference is assumed to be the tanks that are still active in support of programs or will be part of the redevelopment projects

For the purposes of this study, RCRA tank closure could be a potential future source of wastewater Some or all of the RCRA tanks may require decontamination prior to closure It is reasonable to assume that some tanks will require a greater degree of decontamination than others For instance, the tanks involved in the Liquid

Stabilization Program will likely require a fairly aggressive decontamination and cleaning process that will generate some wastewater requiring treatment for radionuclides Relevant studies were utilized to determine potential decontamination methods (Parsons Environmental Services, 1994, Los Alamos Technical Associates, 1995) In addition, the tank closure plans discuss potential decontamination methods, however, the plans do not specify a method or which parts of the tank system may require decontamination (DOE, 1992a, DOE, 1992b, DOE, 1993)

The decontamination methods identified include flushing, high pressure washing, and removal These methods include the following general procedures

- Flushing - involves completely filling tanks with a cleaning solution, which is typically water, dilute nitric acid, or a solvent, and allowing the tanks to soak More than one wash may be required to assure that the tanks are clean

- High Pressure Washing - involves hydroblasting surfaces using water for removing residues The tanks decontaminated using this method must have an opening suitable for insertion of a wand and to allow manipulation to cover the interior surfaces of the tank

- Removal - includes removal of equipment and/or structures for treatment or disposal as hazardous or mixed waste This would be a preferable option if it is more cost-effective or if decontamination of a unit is technically infeasible or poses unacceptable risks to human health and/or the environment

The method that would generate the most wastewater would probably be flushing The actual decontamination and closure of the RCRA tanks will likely be a combination of all three of these methods

For the purposes of a conservative wastewater generation estimate, it is assumed that each tank will be cleaned by filling three times with dilute nitric acid, water or other appropriate aqueous agent The list of RCRA tanks and their volumes was obtained by sorting only the RCRA tanks from the Master Tank Database (EG&G, 1993) The total volume of all RCRA tanks could then be estimated This total volume of tankage is 4,400,000 gallons which gives a wastewater volume of 13,200,000 gallons of wastewater Appendix D presents the listing of the RCRA tanks from the Master Tank Database by building number, tank name, RCRA number, and capacity

The wastewater generated from RCRA tank closure may include high-pH and low-pH solutions, radioactive solutions, and inorganic-contaminated solutions Much of the liquid waste will probably require treatment in Building 374 or similar Some of the initial tank rinsings may require actinide recovery processing in Building 774 prior to treatment in Building 374 The rinsate from the tank washings will be analyzed for indicator parameters based on the hazardous waste constituents previously contained in the system If analysis indicates that the interior and exterior of the tank and/or tank system component meet the closure performance standard (as defined by the closure plan), the tank and/or tank system component will be considered decontaminated with respect to RCRA hazardous waste constituents

2 1 3 5 Tank Management

Wastewater may also be generated in the management of non-RCRA tanks The non-RCRA tanks are raw material or product storage tanks for water, acid, bases, solvents, oil, fuel, and other substances required for previous or current Site activities There are 2,592 total tanks listed in the Master Tank Database, of which 495 are the previously discussed RCRA tanks Of the remaining 2,097 tanks, 899 can be classified as containing relatively innocuous materials such as water or steam The remaining tanks contain process waters, acids, bases, organics or other chemicals

The only category of non-RCRA tanks expected to generate much wastewater during cleanup is the pure product storage tanks It is expected that the majority of the rinsewaters would be treated at the Building 995 WWTP, however, for a few of the product tanks, such as the solvent storage tanks, the rinsewaters may not be accepted at Building 995 for treatment These tanks will be evaluated on a case-by-case basis but are not expected to contribute a significant volume The total volume of the non-RCRA tanks not classified as innocuous is 2,900,000 gallons

2 1 3 6 Decontamination and Decommissioning

A Decontamination and Decommissioning Plan is currently under development for the Site under the management of Paul Bengal It is expected that D&D will include removing fixed equipment, dismantling and removing ventilation systems, gloveboxes, ducts, and stacks, and dismantling or demolishing buildings Some preliminary developments on the D&D process were discussed with Ted Kearnes Pressurized water treated with a special cleansing chemical will be used for surface decontamination A process has been developed that uses an estimated 50 gallons of water per tank, glovebox, or segment of piping

An 8-year plan for decontaminating all the processes at the Site is currently being considered Approximately 100,000 gallons of wastewater generated per year was given as a crude estimate There is likely to be trace amounts of a variety of chemicals in the rinsates It is difficult to estimate realistic concentrations or whether any contaminants will present a concern The chemical additive in the decontamination water is proprietary information and was not revealed to us The EPA requires that this chemical not be released Plans are to precipitate out this chemical before discharging this water to Building 374 Reusing the decontamination water is also being considered If this is done, wastewater volumes generated from process decontamination can be substantially reduced

A specific schedule for process decontamination of all the buildings onsite is not available at this time Through the National Conversion Pilot Program (NCPP), several buildings have a tentative schedule for decontamination and conversion to private use The following timeframes for building conversions were obtained from an interview with Mike Simmons of the Manufacturing Sciences Corporation (MSC)

- Building 883 - 3/95 to 8/96,
- Building 444 - 10/95 to 2/97,
- Building 447 - 10/95 to 2/97, and
- Building 865 - 10/96 to 10/97

Mike Simmons also gave an estimate of an additional 5,000 to 6,000 gallons of decontamination wastewater generated per building per year, which appears to be somewhat consistent with Ted Kearnes' projection

Building deactivation or decommissioning is the final stage of the D&D process It involves decontaminating and/or dismantling the building structure This is not commenced until all the processes inside the building have been decontaminated This phase is expected to generate very little wastewater if any Sometimes this process involves spraying construction debris with water to keep dust down, but this water for the most part evaporates and is not collected for treatment processing

2 1 4 Facility/Building Redevelopment

The NCPP is to convert four facilities at the Site to commercial facilities (MSC, 1995) The project is being implemented in three stages (Stage I has been completed) by MSC Stage I (and Stage I Extension) operations involved contract negotiations, project management activities, initial planning activities, and public consultation and approval activities

Stage II operations will involve further hazards assessments, the cleanup and refurbishment of some of the equipment housed in the NCPP buildings, and activities involving declassification, process verification, additional equipment assessment, and waste management Planned Stage II activities are detailed below

Stage III will involve the selection of a commercial contractor through a competitive bid process Commercial operations will include the fabrication of new commercial products manufactured from scrap metals recovered from the NCPP buildings and elsewhere

Stage II Strategy

Stage II of the NCPP will be completed over three DOE financial years 1995, 1996, and 1997, with Stage II due to be completed by September 30, 1997 The current broad elements of the strategy are to complete cleanup activities in the following areas in the financial years specified

- Building 883, B and C Sides and Basement - FY95,
- Building 444/447 - FY96,
- Building 883, A Side and Annex - FY96, and
- Building 865 - FY97

The years noted are only intended to be general indications of when cleanup work will take place Other activities such as hazards assessment and operational assessment for each building may not necessarily take place in the years specified above

Stage II Technical Activities

The technical activities that are proposed during Stage II can be broadly divided into cleanup, hazards assessment, operational assessment, and waste management The hazards assessment and operational assessment work was started in Stage I and will continue in Stage II as dismantling of equipment provides access to formerly inaccessible areas There will also be some work performed under these categories that was not started in Stage I

Cleanup Activities

The cleanup activities during Stage II consist of decontaminating to baseline levels the buildings and the equipment that will be retained, as agreed by the regulators These cleanup activities would allow use of the NCPP buildings during Stage III The cleanup activities are discussed in detail in the Facility Cleanup Plan that was developed during Stage I This work will be performed in 10 steps, as follows

- Step 1 Removal of loose waste/unwanted equipment,
- Step 2 Cleaning of high contamination areas,
- Step 3 Assembly of decontamination modules,
- Step 4 Removal and decontamination of low contamination items of equipment,
- Step 5 Removal and decontamination of high contamination items of equipment,
- Step 6 Decontamination, dismantling, and removal of services no longer required,
- Step 7 Repairs to structure following removal of equipment,
- Step 8 Dismantling, cleaning, and reassembling retained equipment considered low contamination risk,
- Step 9 Dismantling, cleaning, and reassembling retained equipment considered high contamination risk, and
- Step 10 Final decontamination of building to operational baseline levels

These ten steps will be performed in each of the NCPP buildings During actual work, some of these steps may be performed in parallel, based on the conditions encountered in the cleanup of the buildings

Waste Management Activities

As a result of the work to be carried out in Stage II, waste will be produced During Stage I, a report presenting an estimate of the waste to be generated by the NCPP was developed to support the preparation of the Rocky Flats Plant Waste Management Plan This report was developed to provide the best estimate available of waste types and quantities expected to be generated during cleanup of the NCPP buildings and equipment

The volume of waste that will be generated from cleanup activities (decontamination and dismantling) will be significant As expected, the waste arising from equipment being dismantled forms the majority of the waste quantities identified Other waste from cleanup activities consists of swabs, protective clothing, and protective coatings Waste generated during Stage II process verification activities will include metal chips, welding electrodes, rags, and process wastewater Waste generated during declassification will consist of metal oxides from the melting process and the crucibles used in declassification

The wastes generated during Stage II will be segregated into low-level waste (LLW) and mixed low level waste (MLLW) The waste characterization for LLW and MLLW will, in most cases, be based on process knowledge Where process knowledge is not sufficient to characterize the waste, the waste will be managed by MSC under the more rigorous MLLW category until analytical data are available to complete the characterization

All waste generated during Stage II will be managed under the NCPP Waste Management Plan The primary goal of the Waste Management Plan is to reduce both the amount and toxicity of waste generated during the cleanup of the NCPP buildings The Waste Management Plan will be developed by MSC and approved by DOE's Rocky Flats Field Office prior to any hands-on Stage II activities taking place The Waste Management Plan will specify regulatory requirements, and will contain appropriate procedures for waste stream characterization, packaging, storage, inspections, quality assurance, spill response, and waste minimization

2 2 PROJECTED FLOWS AND CONTAMINANTS OF CONCERN

Table 2 5 summarizes the estimates of volumes of process wastewater potentially requiring treatment at Building 374 or other central wastewater treatment facility

2 3 CONSTRAINTS ON MANAGEMENT OF PROCESS WASTEWATER

Because this category encompasses a wide range of current and future sources, there are a variety of factors that may affect efficient treatment of this water Previous practice has been to categorize wastewater as hazardous, low-level, or mixed simply because of the potential for these constituents (EG&G, 1994i) Reclassification programs are currently ongoing to classify wastewater based on analytical results and process knowledge This reclassification program may lead to the majority of the current process wastewater to be classified as non-hazardous and non-radioactive

TABLE 2 5
PROCESS WASTEWATER VOLUME SUMMARY

PROCESS WASTEWATER SOURCE	VOLUME (gpy) & TIMEFRAME	TREATMENT NEEDS
Process Wastewater		
•Laundry (Building 566)	1,300,000 Present - 2015	Sampling may demonstrate that this source can be treated at the WWTP
•Desaltable waste (Buildings 122, 123, and 444)	297,200 1996 - 2005	This wastewater may require polishing to achieve applicable effluent standards for radionuclides
•Treatable waste (Buildings 707/731, 771/774, 776/777, 779, 881/887, 883, 865/866)	190,000 1996 - 1998 270,000 1998 - 2006 125,000 2006 - 2010	This wastewater is contaminated with trace levels of metals, radionuclides, and potentially organics
Incidental Wastewater		
•904 and 750 Pads, OU1 Regenerant, 910 Brine, 778 Sump, 991 Floor, trucked waste	1,050,000 (1) Present - Indefinite	Depending upon the contamination levels, some of this water may not require treatment prior to discharge, handled on a case-by-case basis
•Solar Pond Water	215,000 1996 - 1997	This wastewater contains nitrates and trace levels of radionuclides, metals, and organics
Liquid Stabilization Program	4,400 June 1996 - June 1999	This is water that may require polishing to achieve applicable effluent standards for radionuclides (particularly plutonium)

PROCESS WASTEWATER SOURCE	VOLUME (gpy) & TIMEFRAME	TREATMENT NEEDS
Residue Stabilization Program	26,400 1998 - 2002	This wastewater should be contaminated with trace levels of actinides and possible up to 100 mg/l of VOCs Chloride concentration may approach 1 percent
Mixed Low-Level and Mixed Transuranic Waste Treatment (2)	<68,000 Periodically from 2005 - 2020	This wastewater should be contaminated with trace levels of metals, radionuclides, and possibly organics May contain RCRA constituents
RCRA Tank Closure	1,300,000 (3) 1996 - 2005	This wastewater could be contaminated with trace levels of radionuclides, metals, and organics May contain RCRA constituents
Non-RCRA Tank Management	900,000 (4) 1996 - 2005	This wastewater could be contaminated with trace levels of organics, metals, and TDS
Decontamination & Decommissioning	100,000 (5) 1996 - 2015	This wastewater could be contaminated with trace levels of radionuclides, metals, and organics
Building Redevelopment		
•Beryllium Buildings (883, 865)	39,800 1998 - TBD	This wastewater could be contaminated with trace levels of depleted uranium, beryllium, metals, oils, coolants, and acid
•Building 460	TBD	

Notes

(1) This flow is highly dependent upon precipitation levels the volume reported is an average of the sources for the past 5 years

Table 2 5 (continued)

(2) Treatment processes and consequential wastewater treatment needs have not been quantified for transuranic waste treatment However it is reasonable to assume that potential wastewater volume would not exceed the volume estimated for mixed low-level waste (<34 000 gpy)

(3) Volume is dependent upon decontamination method (e g full tank flushes) but will likely be a combination of several methods that generate less water than shown here

(4) Volume does not include disposal of pure product in tanks Volume is for three flushings of appropriate tanks

(5) Preliminary estimate by personnel in D&D planning

Such a reclassification could lead to logistical constraints on the transport of these sources to the appropriate treatment facility All of these sources are currently set up to easily discharge to the Process Waste Collection System Storage tanks or repiping may be required if a major reclassification is successful

Any reevaluation of the treatment of these process wastewater sources must consider the RCRA classification of the wastewater There are currently limited facilities onsite (only Building 374) for the treatment of hazardous or mixed wastewater

For the purposes of this study, the total wastewater generated by a certain source or program was calculated for the life of the discharge and divided by the number of years anticipated This straightline approach was necessary at this point for lack of more detailed schedule information The staging of these programs must be evaluated to assure that several of these relatively low volume programs or generators are not discharging the majority of their wastewater in the same timeframe

3 0 DOMESTIC WASTEWATER

Domestic wastewater is treated onsite in the Wastewater Treatment Plant (WWTP), Building 995 The WWTP is designed to handle the sanitary wastewater and light industrial (non-process) wastewater generated at the Site The treatment of regulated wastewaters at the WWTP is not specifically intended based on the treatment process capability or the existing permit situation

According to operations personnel, the design flowrate for the WWTP is 500,000 gallons per day (gpd), although, a limiting condition exists with the chlorine contact tanks This condition limits the throughput of the WWTP to approximately 200,000 gpd[6]

Typical dry weather flows to the WWTP average 150,000 gpd Weekend and off-shift flows average approximately 90,000 gpd Wet weather flows can vary, with a typical average flow of 400,000 gpd and an instantaneous peak flow condition of 1 2 million gpd, which occurred during the unusually wet Spring of 1995 It is believed that there is significant inflow/infiltration occurring in the WWTP collection system Influent and effluent storage facilities planned for the WWTP as part of Phase III upgrades will alleviate the system upsets associated with wet weather conditions In addition, the Phase III upgrades will increase the size of the chlorine contact chamber to bring that system up to the design capacity of the rest of the treatment system There is a study ongoing to evaluate alternative disinfection

6 Personnel communication with Mr Frank Hoffman WWTP Operations Manager September 6 1995

methods, however, regardless of the disinfection process recommended, the limiting flow condition in the disinfection process should be eliminated

Under normal flow conditions, the WWTP is not constrained hydraulically nor is it organically overloaded Based on typical dry weather flows of 150,000 gpd and the chlorine contact tank limitation of 200,000 gpd, the WWTP typically operates at approximately 75% of capacity The average biochemical oxygen demand (BOD) at the WWTP is 90 mg/l The influent BOD is considered low when compared to typical domestic sewage which is approximately 200 mg/l

3 1 EXISTING AND POTENTIAL SOURCES OF DOMESTIC WASTEWATER

The existing sources of domestic wastewater include sanitary wastewater generated by Site personnel, blowdown waters from industrial systems, and light industrial wastewater generated by support facilities outside of the PA which have no potential for radioactive contamination Potential sources of domestic wastewater include reclassified process and environmental restoration wastewater sources - reclassified to more accurately reflect current and future Site activities, future redevelopment and privatization, and environmental restoration activities

3 1 1 General Building Domestic Wastewater

General building domestic wastewater includes the effluent from showers, sinks, toilets, and other standard domestic wastewater sources In addition, there are some roof drains and foundation drains that are collected and discharged directly to the sanitary sewer system Some decrease in general building wastewater may be seen as the D&D of the Site proceeds, however, significant decreases have not been experienced during other downsizing periods at the Site Therefore, for the purposes of this evaluation the future generation of general building wastewater will be considered to be similar to the volumes seen in the last five years This assumption can be reevaluated as the building D&D plans become finalized It should be noted, however, that unless the number of people at the Site decreases dramatically and some of infiltration issues are addressed, the volume of wastewater may not decrease as buildings are deactivated and closed

3 1 2 Industrial Wastewater Sources Treated at the WWTP

The existing industrial wastewater sources include cooling tower and boiler blowdown sources, wash waters, a limited amount of pretreated photo processing wastewater, and other miscellaneous sources A complete list of the current industrial wastewater dischargers is included as Appendix E The total volume of industrial wastewater generated accounts for approximately 10% of the influent to the WWTP Reclassification of some of the hazardous and radioactive streams to non-hazardous, non-radioactive may increase the volume of industrial wastwater in the future There are currently several sources that are classified as hazardous and/or radioactive based simply on where they originate An effort is underway to reclassify streams which may increase the volume of wastewater sent to the WWTP

For the purposes of this evaluation, any future increase in industrial wastewater is not expected to increase the total flow to the WWTP significantly and it is extremely unlikely that the total capacity of the treatment facility would be exceeded due to an increase in industrial wastewater Even if all of the wastewater currently treated at the Building 374 facility were reclassified and sent to the WWTP, the influent to the WWTP would only increase by a few percent

3 1.3 Facility/Building Redevelopment

The NCPP (MSC, 1995) is a test program designed to evaluate the redevelopment of the Site for commercial private useage As part of this test program, four buildings at the Site are scheduled for conversion to private industrial usage This program was discussed in detail in Section 2 1 4 The effect of the NCPP on the future volume of wastewater discharged to the WWTP is the addition of workers to these facilities and the potential for industrial discharge The effect on the sanitary wastewater is not expected to be significantly different than historically seen for these buildings as the facilities are expected to utilize a similar number or personnel Any additional industrial wastewater discharges would be expected to be similar to those seen historically from these buildings as the private industry will be similar to the previous mission of the buildings The industrial wastewater discharges must meet the acceptance criteria for the WWTP for discharge and will likely be pretreated by the discharger prior to release to the sanitary sewer system The expected volumes of wastewater from these private facilities were also discussed in detail in Section 2 1 4

3 2 PROJECTED FLOWS AND CONTAMINANTS OF CONCERN

The projected flows and contaminants of concern are not expected to differ significantly from those seen in the past at the WWTP For the purposes of this study the projected flowrate is 55,000,000 gpy based on a typical dry weather flow of 150,000 gpd This flow does not account for decrease in flow on the weekends or increase in flow during wet seasons, however, the use of the average flow for 365 days per year should allow for a conservative estimate that accounts for wet seasons

3 3 CONSTRAINTS ON MANAGEMENT OF DOMESTIC WASTEWATER

The management of domestic wastewater at Rocky Flats is relatively straight forward The National Pollution Discharge Elimination System (NPDES) permit is currently undergoing modification, however, the existing treatment system should provide adequate treatment to maintain compliance The issues that may constrain the reclassification of process wastewater sources as domestic or industrial wastewater include the characteristics of the water, any regulatory issues, constituents that are not treated by the existing process, and any logistical problems with transferring water to the WWTP such as tying into existing sewer lines

4 0 SURFACE WATER

In evaluating treatment needs associated with surface water, three potentially significant surface water sources at the Site were investigated

- Surface water collected with alluvial groundwater at OU4,
- The A, B, and C series ponds, and
- Water collected at a Corrective Action Management Unit (CAMU) and sanitary landfill to be constructed

Each of these sources is discussed in the following sections

4 1 OPERABLE UNIT 4

Water contaminated primarily with nitrates is currently being recovered with the ITS located just northeast of the OU 4 Solar Evaporation Ponds The ITS collects both surface water and alluvial groundwater and combines both for transfer to three modular storage tanks (MSTs) The nitrate-contaminated water is periodically transferred from the MSTs to Building 374 for treatment This source is a combination of surface water and groundwater and is managed at the Site as a groundwater source Therefore, details on the OU4 nitrate-contaminated water are provided as part of the groundwater discussions in Section 5 0

4 2 A, B, AND C SERIES PONDS

The A, B, and C surface water ponds function mainly as stormwater management facilities and will continue to be operated in this manner The ponds also provide emergency containment in the event of large storms or unplanned contaminant releases

A draft version of the *Rocky Flats Surface Water Pond Operations Plan* (DOE, 1995c) is currently under review by regulatory agencies and stakeholders The plan identifies the transition steps necessary to modify the operations of the Site stormwater detention ponds in accordance with the implementation of Rocky Flats Surface Water Management Option B The plan emphasizes controlled detention as the key element of pond operations Controlled detention will allow natural physical, chemical, and biological processes to remove or otherwise diminish contaminant levels during low flow periods or small storms Operational changes will also maximize storage and detention of large storms when contaminants are likely to be mobilized Controlled detention practices will be adopted gradually as downstream improvements are completed (e g , the Standley Lake Protection Project and Woman Creek Reservoir)

It is expected that controlled detention of the waters collected in the A, B, and C series ponds will preclude any need to apply specific treatment processes to the surface waters prior to discharge This expectation is based on a review of extensive water quality data for previous discharges from the ponds With rare exceptions, the data show that discharges have consistently met Site-specific surface water quality stream standards for the State of Colorado without treatment Potential water treatment needs that may arise under abnormal operating conditions (e g , spills of contaminants into ponds) will be addressed with mobile, temporary treatment systems Such systems will be utilized to treat surface water contained in the A, B, and C series ponds on an as needed basis in order to assure that surface water quality stream standards are met

4 3 CAMU AND SANITARY LANDFILL

A CAMU and sanitary landfill are currently planned to support continuing operations at the Site Each of these facilities has the potential of being a source of contaminated surface water (leachate) during their operational periods[7]

4 3 1 Sanitary Landfill

A sanitary landfill is to be opened for the disposal of sanitary wastes generated at the Site It is estimated that approximately 50 gallons of potentially contaminated surface water will be collected daily while the sanitary landfill is operational The amount of water collected daily could be as high as 10,000 gallons during a 25 year precipitation event Water collected will be held in three 2,500 gallon storage tanks prior to transfer to the WWTP On a continuous basis, the water transfer rate to the WWTP could range from 0 035 gpm (50 gallons/day) to 6 9 gpm (10,000 gallons/day) The landfill is expected to be operational for up to 40 years, at which time an engineered cover would be installed that would essentially eliminate leachate generation

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[7] Information provided in Sections 4 3 1 and 4 3 2 was derived from personal communications with Ms Dorthea Hoyt and Mr Bob Campbell of the Site

4 3 2 Corrective Action Management Unit

A CAMU is scheduled to begin receiving soils contaminated with organics, metals, and/or radionuclides in October, 1996 The source of the contaminated soils will be environmental restoration activities at the Site It is estimated that one to two million gallons of leachate will be generated per year during a two to three year operational period for the CAMU (approximately two to four gpm on a continuous basis) This leachate will result from the accumulation of surface water in the active parts of the CAMU Surface water will be collected from the CAMU and transferred to three 500,000 gallon storage tanks dedicated to storing the CAMU leachate Stored leachate will be transferred periodically to a central treatment facility It is believed that this leachate can be treated with the combined OU1/OU2 treatment facility The estimate for leachate generation is high as it does not take into account losses due to evaporation, absorption, etc

4 4 PROJECTED FLOWS AND CONTAMINANTS OF CONCERN

Table 4 1 summarizes the estimates of volumes of surface water potentially requiring treatment at Building 374 or other central wastewater treatment facility

4 5 CONSTRAINTS ON MANAGEMENT OF SURFACE WASTEWATER

There is the potential for significant variability in the contaminant types and concentrations in surface water collected at the CAMU The large holding capacity at the CAMU, however, should provide a means of equalizing flow and contaminant concentrations so that the water is within design criteria or waste acceptance criteria for a dedicated water treatment system such as OU1/OU2

TABLE 4 1
SURFACE WATER VOLUME SUMMARY

SURFACE WATER SOURCE	VOLUME (GPM) & TIMEFRAME	TREATMENT NEEDS
Operable Unit 4	(not applicable)	Surface water collected at OU4 is mixed with groundwater and is addressed in Section 5 0
A, B, and C Series Ponds	0	Surface water managed in the A, B, and C series ponds is not expected to require any specific treatment applications Treatment will only occur on an as-needed basis to meet surface water quality stream standards
Sanitary Landfill	0 035 - 6 9 1996 - 2036	Landfill is for municipal wastes (e g , common garbage from sources such as the cafeteria) Leachate will undergo treatment at the Sewage Treatment Plan (Building 995) Landfill may be operational up to 40 years
Corrective Action Management Unit	2 - 4 October 1996 to October 1999	This water is leachate that may require treatment to achieve applicable effluent standards Leachate may contain radionuclides, organics, and metals

A change in the management of surface water in the A, B, and C-Series ponds could significantly alter water treatment requirements at the Site Current practices for discharge of collected pond water do not require treatment, and it is expected that any unanticipated need for treatment would be addressed with a dedicated treatment facility

5 0 GROUNDWATER

Environmental restoration activities at the Site are expected to include the recovery of contaminated groundwater that may require treatment in order to meet established water quality standards for the Site Several key assumptions were made in order to project volumes and contaminant characteristics of distinct groundwater contaminant plumes potentially requiring treatment These assumptions include

- The enforceable cleanup standards for groundwater will be the open space surface water preliminary programmatic remediation goals (hereinafter referred to as surface water PPRGs)

- Four areas of the Site have distinct groundwater contaminant plumes that require treatment in order to meet the surface water PPRGs These areas include OU1, OU2, OU7, and the Industrial Area Further clarification of groundwater contaminant plume definition is provided in Section 5 1

- The distinct nitrate plume noted on Figure 5-1 for the industrial area will be recovered for treatment using the ITS Collected water will be treated for denitrification using Building 374 or a new dedicated treatment system The nitrate contaminant plume is associated with OU4, which is considered to be part of the industrial area for this report Details on the nitrate contaminant plume and the ITS are included in Section 5 2

- Contaminated groundwater associated with OU7 will be remediated using a passive collection and treatment system Details on the OU7 groundwater treatment are provided in Section 5 3

5 1 GROUNDWATER CONTAMINANT PLUME DEFINITIONS

Areas of groundwater that are expected to require remediation were delineated by comparing groundwater data currently in RFEDS with the surface water PPRGs The surface water PPRGs are appropriate given plausible future exposure scenarios/pathways at the Site Specifically, under currently expected land uses and agreed upon exposure scenarios/pathways, there will be no exposures to groundwater unless it surfaces in seeps or streams Accordingly, sitewide risk evaluations will use the office worker, construction worker, and open space scenarios when evaluating likely exposure scenarios/pathways This type of approach at the Site conforms with the final recommendations of the Rocky Flats Future Site Use Working Group (Rocky Flats, 1995) The United States Environmental Protection Agency, the Colorado Department of Public Health and the Environment, and the DOE have concurred with the working group's recommendations[8]

The comparison of RFEDS groundwater data against the surface water PPRGs resulted in the definition of groundwater contaminant plumes shown on Figure 5-1[9] These contaminant plumes are comprised of volatile organic compounds (VOCs), nitrates, polychlorinated biphenyls [(PCBs) noted as aroclor on Figure 5-1], and radionuclides

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8 This information was derived from a personal communication with Mr Win Chromec of the Site

9 Comparison of groundwater data against surface water PPRGs and preparation of Figure 6-1 by Mr Barry Roberts and Mr Steve Joliat of the Site

It is important to note that the nitrates and PCBs make up distinct contaminant plumes that will be addressed through actions associated with OUs 4 and 7, respectively Additional details on the nitrate and PCB contaminant plumes are provided in Sections 5 2 and 5 3, respectively

5 2 NITRATE-CONTAMINATED GROUNDWATER AT OU4

The nitrate-contaminated groundwater at OU4 is currently being collected for treatment by the ITS The ITS also collects contaminated surface water at OU4, however, the surface water is mixed with contaminated groundwater at the ITS collection sump It is assumed that this system, along with possible future groundwater wells, will adequately recover groundwater that is contaminated with nitrates/nitrites at concentrations greater than the surface water PPRGs The recovery of the contaminated groundwater will be consistent with the future use scenario for the Site Nitrate/Nitrite concentrations are generally within the range of 400 to 1,000 mg/l (as Nitrogen) at the ITS Pumphouse[10] To date, other contaminants in the OU4 groundwater (e g , organics, radionuclides, etc) have not been present in significant concentrations and may not require treatment in order to meet applicable water quality standards for a treatment system effluent Additional water analysis is required, specifically an isotopic analysis, to accurately assess potential treatment needs beyond denitrification Also, a determination must be made as to what effluent standards will be enforced in association with any OU4 groundwater treatment operations The Applicable or Relevant and Appropriate Requirements (ARARs) and To-be-Considered criteria identified in the Proposed Action Memorandum (PAM) for OU7 (DOE, 1995d)

[10] Memorandum from Barry L Roberts to John Hopkins on use of ITS in future remediation September 11 1995

may be an appropriate starting point for identifying effluent standards For example, this PAM identified DOE's derived concentration guidelines for radionuclide effluents

Recovered nitrate-contaminated groundwater is currently being treated at Building 374 Table 5 1 shows the volumes of nitrate-contaminated groundwater that have been transferred to Building 374 for treatment since calendar year 1993[11]

TABLE 5 1
OPERABLE UNIT 4 GROUNDWATER TREATMENT VOLUME

CALENDAR YEAR	VOLUME OF NITRATE-CONTAMINATED GROUNDWATER TRANSFERRED TO BUILDING 374 (GALLONS)
1993	718,952
1994	1,109,971
1995 (first 7 months)	3,091,600

It should be noted that the volume reported for 1995, which had significantly higher than average spring rainfall, is only through July A dedicated denitrification system could be utilized for the OU4 groundwater treatment Also, treatment beyond denitrification, if necessary, may be accommodated by a central treatment facility (e g , the planned combined OU1/OU2 treatment facility)

The average yearly transfer rates ranged from 1 4 gpm during 1993 to 10 2 gpm during the first half of 1995 The recovery rates are highly dependent on precipitation events As such, groundwater transfer rates from OU4 to a treatment facility could vary significantly through the year, depending on contaminated groundwater storage capacity The peak groundwater recovery rate at the OU4 sump was reached during the Spring of 1995 This peak recovery was the design capacity of the pump at the

11 Personal communication (FAX) from Carrie Wesley of RMRS dated 9/1/95

collection sump Groundwater captured by the ITS in excess of the pump limitations overflowed the sump and drained over the surface

5 3 CONTAMINATED GROUNDWATER AT OU7

Contaminated groundwater at OU7, including PCB contaminants present above surface water PPRGs, will be remediated where it surfaces at seep SW-097, which is located between the landfill and the East Landfill Pond Treatment at this seep is expected to begin in late December 1995 per the *Modified Proposed Action Memorandum Passive Seep Collection and Treatment Operable Unit No 7, Final* (DOE, 1995d) Effluent from the treatment system will enter the East Landfill Pond, which, when necessary to maintain it at an appropriate level, will be discharged to the A-Series ponds

5 4 CONTAMINATED GROUNDWATER AT OU1, OU2, AND THE INDUSTRIAL AREA

The remaining evaluation of water treatment needs associated with groundwater environmental restoration activities at the Site focuses on the VOC- and radionuclide-contaminated plumes within OU1, OU2, and the Industrial Area, i e , those contaminant plumes specifically noted on Figure 5-1

The following water treatment scenarios have been analyzed with regard to potential groundwater recovery volumes and contaminant levels associated with the remediation of the groundwater contaminant plumes

- **Scenario 1** Aggressive pump and treat of all groundwater contaminated above surface water PPRGs,

- Scenario 2 Containment with passive groundwater extraction and treatment, and

- Scenario 3 Passive treatment barriers

Under these scenarios, surface water PPRGs would likely be met over varying time periods, however, for purposes of evaluating water treatment needs, it was assumed that each scenario would be implemented over a long term, i e , greater than five years The expected period of implementation under each scenario could be further refined through groundwater modeling

The selected water treatment scenarios would result in a range of groundwater volumes requiring treatment The aggressive pump and treat scenario, which includes the use of an array of groundwater extraction wells located within and around the identified plumes (see Figure 5-2), would likely generate the greatest volume of groundwater influent to a water treatment facility Scenario 2, containment with passive groundwater extraction and treatment, includes the use of vertical barriers to control the movement of both "clean" and contaminated groundwater and interceptor trenches to recover contaminated groundwater An estimated configuration of interceptor trenches is presented in Figure 5-3 Scenario 2 would generate less volume of groundwater requiring treatment than Scenario 1 Scenario 3, passive treatment barriers, considers the application of passive treatment technologies for treatment of groundwater in situ (e g , air sparging/vapor vacuum extraction, reductive dechlorination applied as a passive treatment wall, bioremediation, etc) Scenario 3 would not generate groundwater requiring treatment at a central treatment facility Additional details on the potential groundwater treatment scenarios are provided in the following sections

5 4 1 Aggressive Pump and Treat

Under this scenario, the greatest volume of groundwater influent to a treatment facility was estimated The scenario includes the use of groundwater extraction wells located within and around the VOC and radionuclide contaminant plumes to recover groundwater with contaminants in concentrations that are greater than the surface water PPRGs It is expected that an array of wells similar to that shown in Figure 5-2 would be sufficient to recover the contaminated groundwater The assumed groundwater recovery rate for each of the wells is 0 75 gpm Note that the wells have been tabulated in Figure 5-4 in groups according to the previously defined groundwater plumes The predicted recovery rates are strictly estimates based on currently available information supporting the OU2 Corrective Measures Study/Feasibility Study (CMS/FS)[12] The recovery rate is for wet season conditions that may not be sustainable over the entire year As such, the estimated total recovery rate of 50 gpm is probably representative of the greatest rate that would be seen under the aggressive pump and treat scenario

Treatment of groundwater recovered from wells in OU1, OU2, and the Industrial Area could be at a central treatment facility This groundwater is expected to be contaminated primarily with VOCs above the surface water PPRGs Radionuclides

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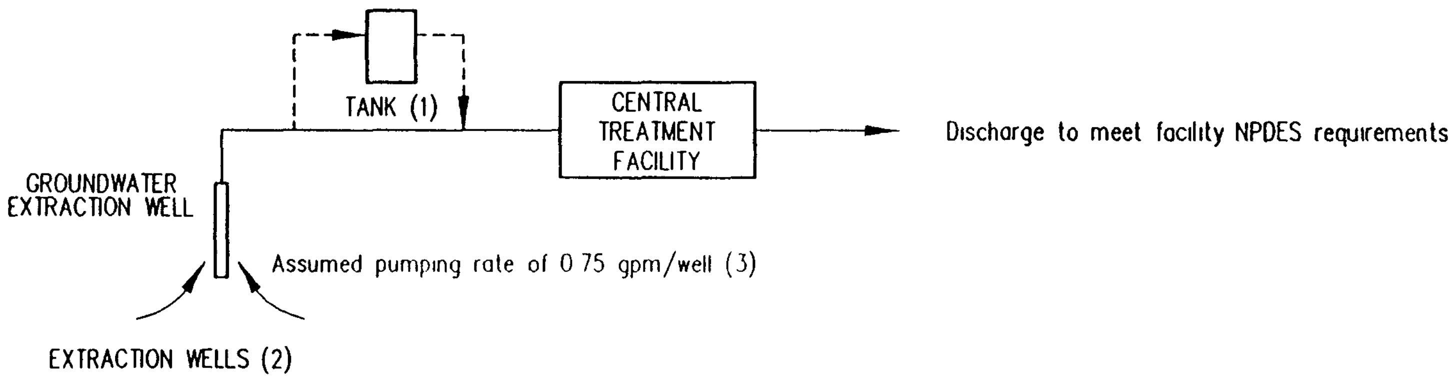
[12] The array of groundwater wells and their estimated recovery rates were provided by Barry Roberts of RMRS based on his review of information supporting the Operable Unit 2 CMS/FS

SCENARIO 1 – AGGRESSIVE PUMP & TREAT OF ALL GROUNDWATER CONTAMINATED ABOVE SURFACE WATER PPRGs



ASSUMED WELL NUMBERS				
CONTAMINATED PLUME AREA	SURFICIAL MATERIAL WELLS	BEDROCK WELLS	TOTAL WELL NO	TOTAL FLOW (gpm) WELL NO • 0 75
OU1	2	0	2	1 5
OU2	45	5	50	37 5
INDUSTRIAL AREA	13	0	13	11 3
TOTAL	60	5	65	49

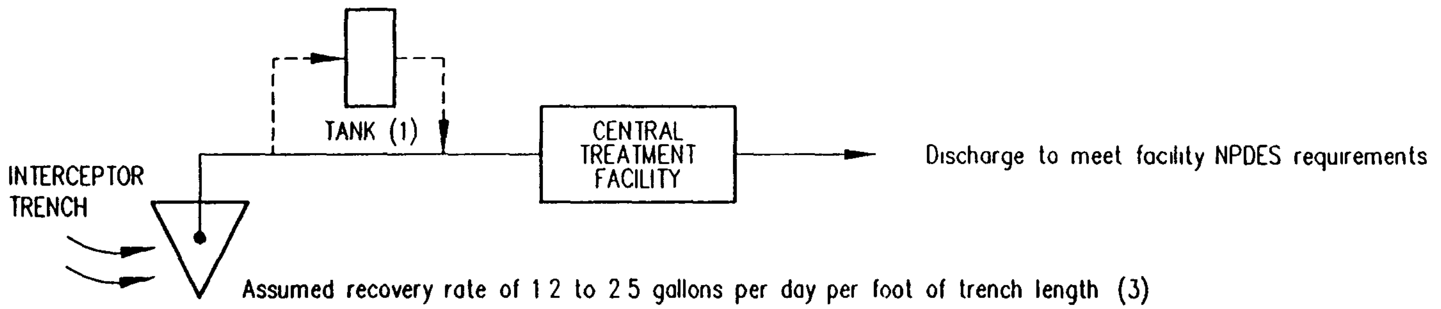
(1) Tank is shown for optional stroage of groundwater from isolated extraction wells (e g , extraction wells within the industrial area)

(2) Includes extraction wells throughout Operable Unit 2 and the industrial area, and the operable unit 1 collection well and trench drain Assumed extraction well configuration shown on FIGURE 5-2 Extraction well configuration was approximated by Barry Roberts

(3) Estimated pumping rate of 0 75 gpm based on the Operable Unit 2 CMS/FS report Rate is for wet season conditions and may be sustainable throughout the year

Figure 5-4 Scenario 1 Groundwater Recovery Estimates

SCENARIO 2 – CONTAINMENT WITH PASSIVE EXTRACTION AND TREATMENT



INTERCEPTOR TRENCHES (2)

ASSUMED INTERCEPTOR TRENCH CONFIGURATION			
CONTAMINATED PLUME AREA	TOTAL LINEAR FEET OF TRENCH	TOTAL FLOW (gpm) Linear feet x 1 2 gal/day/ft / 24 hr/day x 60 min/hr	TOTAL FLOW (gpm) Linear feet x 2 5 gal/day/ft / 24 hr/day x 60 min/hr
OU1	519	0 43	0 90
OU2	4,012	3 34	6 96
INDUSTRIAL AREA	2,693	2 24	4 96
TOTAL	7224	6 01	12 54

(1) Tank is shown for optional storage of groundwater from isolated trenches (e g, interceptor trenches within the industrial area)

(2) Includes interceptor trenches throughout the RFETS See FIGURE 5-3 for approximated trench configuration Trench configuration was approximated by Barry Roberts RFETS

(3) Estimated recovery rate per linear foot of trench is based on the recovery of groundwater at the existing Operable Unit 4 interceptor trench (written communication with Barry Roberts, RMRS)

Figure 5-5 Scenario 2 Groundwater Recovery Estimates season conditions that may not be sustainable over the entire year As such, the estimated recovery rate is probably representative of the greatest rate that would be seen under the passive collection scenario

5 4 3 Passive Treatment Barriers

The use of passive treatment barriers as described in Section 5 4 would not generate any groundwater for treatment

5 5 EXISTING OU1/OU2 TREATMENT SYSTEM

The OU2 Field Treatment Unit (FTU) has recently been relocated to Building 891 to be combined with the OU1 treatment system Ultimately, the combined systems are expected to be configured to provide treatment capabilities for radionuclide and metals removal as well as organics destruction The primary unit operations of the combined OU1/OU2 treatment system are UV/peroxide oxidation, ion exchange, precipitation, and filtration Additional unit operations to improve the performance of the OU1/OU2 treatment system are currently under investigation The OU1 treatment system was designed to treat organic contaminants in groundwater at approximately 30 gallons per minute (gpm)

The average groundwater recovery rate from OU1 since September 1994 has been approximately 0 9 gpm Prior to September 1994, the OU1 system treated wastewater from the Building 881 outfall This source of wastewater was eliminated and therefore treatment was no longer necessary Groundwater currently being treated comes from the French drain and the OU1 (Individual Hazardous Substance

Site 119 1) groundwater recovery well Typical contaminants are chlorinated organics such as trichlorethylene at approximately 10 micrograms per liter (µg/l)

Groundwater recovery at OU2 has been at seep SW59 Two other collection points, SW61 and SW132, were discontinued in May 1994 The flow from seep SW59 at OU2 has ranged from approximately 05 gpm to 25 gpm There is significant variability in the flow at seep SW59, depending on precipitation levels Collected groundwater has contained trace levels of metals and radionuclides

5 6 CONSTRAINTS ON MANAGEMENT OF GROUNDWATER

The greatest potential constraint on the management of groundwater is the concentration standard that may be enforced at the Site The use of drinking water standards (i e , maximum contaminant levels) to establish groundwater remediation goals would greatly increase the amount of groundwater requiring treatment relative to the amount estimated in this report using surface water PPRGs as cleanup goals The standards enforced on treatment system effluents associated with environmental restoration activities are also a potential significant constraints on the management of groundwater Again, the use of drinking water standards for treatment system effluents may require treatment of contaminants that are not targeted as part of the groundwater remediation effort (i e , the contaminant concentrations in the groundwater are not greater than surface water PPRGs) Besides the potential constraints associated with groundwater standards, there are no significant constraints on groundwater management at the Site, including no restraints on treatment technologies, recovery systems, and monitoring systems

6 0 INCIDENTAL/MISCELLANEOUS WATER

Miscellaneous water includes those sources that are not consistently sent to Building 374 or other facility for treatment and are generated on an irregular basis These waters are generally sampled and discharged to the most appropriate location on a case-by-case basis after considering the analytical results for the source In addition to treatment at Building 374, these sources are also often discharged directly to the environment, treated at the OU1/OU2 facility, or discharged to the WWTP

6 1 EXISTING AND POTENTIAL SOURCES

The existing sources of miscellaneous wastewater include the decontamination pads, waters generated during and by construction activities, and water collected in the foundation drains of some buildings These are discussed in the following sections

6 1 1 Decontamination Pad Operations

There are two facilities designated for decontamination pad operations at the Site

- The 903A Main Decontamination Facility (MDF), and
- The Protected Area Decontamination Facility (PADF)

Each of these facilities has a decontamination wastewater capacity of approximately 12,000 gallons per month (144,000 gpy)

Decontamination wastewater is generated as a result of equipment "washing" that occurs at each of the decontamination pads The methodology followed for the handling of wastewater is the same at each pad and, in general, includes the following elements which were summarized from information included in the *Waste Stream and Residue Identification and Characterization* reports for Buildings 903 A and PADF (EG&G, 1994d and EG&G 1994e, respectively) with supplemental information from Mr Terry Toler, the supervisor of decontamination pad operations

- Wastewater is first collected in a sump where heavy solids are settled,
- Wastewater is transferred from the sump to two solids removal systems that utilize cyclone separation,
- Wastewater from the cyclones is transferred to three sedimentation tanks that are linked in series Detention time is approximately 24 hours for each tank,
- Wastewater from the third tank in the series of three tanks is transferred to a holding tank, and
- Wastewater is periodically transferred to Building 374 or Building 891 The batch transfers range from 2,500 - 4,000 gallons each

and occur twice a month This equates to yearly range of 30,000 to 48,000 gallons

Wastewater that is transferred from the decontamination pads to Buildings 374 or 891 is usually contaminated with trace levels of metals, radionuclides, and/or organics There is a potential for additional decontamination water from the planned CAMU at the Site The CAMU may include a dedicated decontamination pad which will generate wastewater at approximately 365,000 gpy[13] Contaminants in this wastewater are expected to be similar to those in the wastewater from the MDF and PADF

The decontamination pads will be required in order to support site decontamination activities and they should be considered as a source of wastewater until the buildings on the Site are closed Depending upon the final OU remedies, the decontamination pads may also be required to support these activities

6 1 2 Construction Waters

The waters collected in support of construction activities include primarily precipitation and groundwater that collects in utility pits, electrical vaults, valve vaults, manholes, excavations, pits, trenches, ditches, or depressions In addition, waters collected from the fire suppression system due to actuation, testing, or maintenance, and finally water collected from boreholes as a result of testing or sampling activities are included in this source category All of these water sources have the potential of containing contaminants at concentrations higher than the applicable standards

13 Wastewater estimate based on the decontamination of approximately 10 trucks per day at 100 gallons per truck

These sources are typically collected in drums or other appropriately sized containers, sampled and discharged appropriately according to the results Approximately 75% of the construction waters collected and sampled are found to be below the discharge standards for this type of source and are discharged directly to the environment (personnel conversation with Ron Henry) Water is transported to Building 374 or other treatment facility for treatment when required based on the results of the water sampling and analysis

6 1 3 Foundation Drains

Groundwater infiltration and precipitation are the major sources of foundation drain waters These waters have the potential of containing elevated concentrations of organics, metals, and radionuclides The elevated concentrations may stem from contaminated groundwater migrating from sources not associated with a specific building, or from water that contacts contaminated surfaces (e g , roof and associated drains, soils, etc) that are part of or near a specific building According to the *Final Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area* (DOE, 1994b), foundation drains have been identified for 20 buildings in the Industrial Area The same report also states that only foundation drains for Buildings 559, 561, and 886 produce water requiring treatment Water collected in the foundation drain for Buildings 559 and 561 is transferred to the WWTP for treatment, while water collected in the foundation drain for Building 886 is transferred to Building 374 for treatment

The flowrates for the aforementioned foundation drains were not provided in the Industrial Area IM/IRA, however, based on data for the Building 881 foundation drain collection rate, it is expected that each building's foundation drains will produce foundation drain water that is consistent with the season and will likely be comparable to the Building 881 foundation drain water production range of 2 3 gpm to 15 gpm (typically 3,300 gpy)

6 2 PROJECTED FLOWS AND CONTAMINANTS OF CONCERN

TABLE 6 1
MISCELLANEOUS WATER VOLUME SUMMARY

PROCESS WASTEWATER SOURCE	VOLUME (GPY) & TIMEFRAME	TREATMENT NEEDS
Decontamination Pads	60,000 - 96,000 (1) 1996 - 2015	The wastewater may contain radionuclides, metals, organics All contaminant levels will be dependent on location of equipment activity
Construction Waters	Infrequent 1996 - 2015	Sampled and treated on a case-by-case basis Some water can contain radionuclides, metals, or organics
Foundation Drains •Buildings 559 and 561 •Building 886	2 3 - 15 gpm (during precipitation events) 1996 - TBD 2 3 - 15 gpm (during precipitation events) 1996 - TBD	Potentially contaminated with elevated concentrations of radionuclides, metals, and organics

Notes
(1) A third decontamination pad may be constructed to support operation of the planned CAMU This dedicated decontamination pad may generate up to 365 000 gpy of wastewater

6 3 CONSTRAINTS ON MANAGEMENT OF MISCELLANEOUS WATER

The management of the miscellaneous wastewater sources needs to be handled on a case-by-case basis after considering the analytical results and characterization of the source Operating procedures should be written, if not already written, describing the sampling and discharge procedures to be followed in discharging of miscellaneous wastewaters

In general, the miscellaneous wastewaters do not need to be treated at a specific treatment facility as long as the Site has capability to treat hazardous and non-hazardous wastewaters with trace levels of radionuclides, metals, and organics